UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Master of Business Administration (MBA)

(Effective from Session 2013-2014)

STUDY AND EVALUATION SCHEME

COURSE: MBA Effective from Session 2013-2014 Year 1 Semester 1

S.N.	**Course Code**	**Subject**	**EVALUATION SCHEME**				
			SESSIONAL EXAMS			**ESE**	**Total**
			CT	**TA**	**Total**		
1.	NMBA 011	Managing Organization	**30**	20	50	100	150
2.	NMBA 012	Managerial Economics	**30**	20	50	100	150
3.	NMBA 013	Business Accounting	**30**	20	50	100	150
4.	NMBA 014	Business Environment	**30**	20	50	100	150
5.	NMBA 015	Business Statistics	**30**	20	50	100	150
6.	NMBA 016	Marketing Management	**30**	20	50	100	150
7.	NMBA 017	Communication for Management	**30**	20	50	100	150
8.	NMBA 018	Fundamentals of Computer & Information System	**30**	20	50	100	150
		Total					**1200**

STUDY AND EVALUATION SCHEME

COURSE: MBA Effective from Session 2013-2014 Year 1 Semester II

S.N.	Course Code	Subject	EVALUATION SCHEME				
			SESSIONAL EXAMS			ESE	Total
			CT	TA	Total		
1.	NMBA 021	Managing Human Resources	**30**	20	50	100	150
2.	NMBA 022	Business Laws	**30**	20	50	100	150
3.	NMBA 023	Customer Relationship Management	**30**	20	50	100	150
4.	NMBA 024	Financial Management	**30**	20	50	100	150
5.	NMBA 025	Operation Research					
6.	NMBA 026	Cost & Management Accounting	**30**	20	50	100	150
7.	NMBA 027	Operations Management	**30**	20	50	100	150
8.	NMBA 028	Research Methodology	**30**	20	50	100	150
9	NMBA 029	Comprehensive Viva (CV)					100
		Total					**1300**

STUDY AND EVALUATION SCHEME

COURSE: MBA Effective from Session 2013-2014 Year 2 Semester III

S.N.	Course Code	Subject	EVALUATION SCHEME				
			SESSIONAL EXAMS			ESE	Total
			CT	TA	Total		
1.	NMBA 031	Entrepreneurship Development	**30**	20	50	100	150
2.	NMBA 032	International Business Management	**30**	20	50	100	150
3.	NMBA 033	Rural Development	**30**	20	50	100	150
4.	NMBA 034	Project Management	**30**	20	50	100	150
5.		Specialization Group -1 Elective 1*	**30**	20	50	100	150
6.		Specialization Group -1 Elective 2*	**30**	20	50	100	150
7.		Specialization Group -2 Elective 1*	**30**	20	50	100	150
8.		Specialization Group -2 Elective 2*	**30**	20	50	100	150
9.	NMBA 035	Summer Training Project Report	**-**	-	-	-	150
10.	AUC-001/ AUC-002	*** Human Value & Professional Ethics/ Cyber Security*	15	**10**	**25**	**50**	**75**
		Total					**1350**

**** Marks will be not added in TOTAL, it is qualifying paper.**

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

COURSE: MBA Effective from Session 2013-2014 Year2 Semester IV

S.N.	**Course Code**	**Subject**	**EVALUATION SCHEME**				
			SESSIONAL EXAMS			**ESE**	**Total**
			CT	**TA**	**Total**		
1.	NMBA 041	Strategic Management	**30**	20	50	100	150
2.	NMBA 042	Insurance & Risk Management	**30**	20	50	100	150
3.	NMBA 043	Hospitality & Tourism Management	**30**	20	50	100	150
4.	NMBA 044 -	Behavioral Finance	**30**	20	50	100	150
5.	-	Specialization Group -1 Elective 3*	**30**	20	50	100	150
6.	-	Specialization Group -2 Elective 3*	**30**	20	50	100	150
7.	NMBA 045	Research Project Report	**30**	20	50	100	150
8.	NMBA 046	Comprehensive Viva (CV)	**-**	-	-	-	100
	AUC-002/ AUC-001	*** Cyber Security / Human Value & Professional Ethics*	15	**10**	**25**	**50**	**75**
9.		Total	**-**	-	-	-	1150
		Grand Total(Sem. 1 to 4)					**5000**

TA – Teacher Assessment
CT – Cumulative Test
ESE - End Semester Examination.

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

ELECTIVE PAPERS

Specialization Group: Human Resource

Course Code

1 NMBA HR 01 Leadership & Personality Development………… (III Semester)

2. NMBA HR02 Industrial Relations & Labour Enactments……… (III Semester)

3. NMBA HR 03 Negotiation & Counseling ……………………… (IV Semester)

Specialization Group: Marketing

Course Code

1. NMBA MK 01 Consumer Behaviour & Customer Loyalty…………. … (III Semester)

2. NMBA MK 02 Integrated Marketing Communications ………………... (III Semester)

3. NMBA MK 03 Retailing & Distribution Management ……………… (IV Semester)

Specialization Group: Financial Management

Course Code

1. NMBA FM 01 Security Analysis & Investment Management ……...(III Semester).

2. NMBA FM 02 Management of Financial Institutions & Services…. (III Semester).

3. NMBA FM 03 Tax Planning and Management …..……………….. (IV Semester)

Specialization Group: Information Technology

Course Code

1. NMBA IT 01 Database Management System ………………….. (III Semester)

2. NMBA IT 02 System Analysis & Design………………………. (III Semester)

3. NMBA IT 03 Data Communication & Network ……………… (IV Semester)

Specialization Group: International Business

Course Code

1. NMBA IB01 International Marketing Management …….…………….. (III Semester)

2. NMBA IB02 International Logistics & Documentation ………………. (III Semester)

3. NMBA IB03 International Financial Management …………………… (IV Semester)

Specialization Group: Rural Development

Course Code

1. NMBA RD0 1 Rural Marketing…………………………………………………. (III Semester)

2. NMBA RD 02 Micro Finance, Small Group Management, and Cooperatives …. (III Semester)

3. NMBA RD03 Food Technology & Processing Management ………………. (IV Semester)

MASTER OF BUSINESS ADMINSTRATION

The MBA course aims at providing inputs to the students relevant to the business, industry and trade so that they can function in different organizations and face the challenges arising there from. The course not only aims at providing knowledge and skills in different areas of management, but also provides inputs necessary for the overall development of the personality of the students.

The structure of the course is designed in a way that students have to study the core courses from different functional areas of management that are made compulsory. Later on, specializations are offered in functional areas where the students can opt for two specializations out of the six ordered. Marketing, Finance, IT, HR, International Business and Rural Development. Right from the beginning of the course, the focus is on providing relevant inputs through case discussion / analysis, simulation games, note plays etc, keeping in mind the current business scenario.

Broadly, the course is of two years divided into four semesters, each semester having eight compulsory papers of 40 sessions each of one hour duration. There is a system of dual specialization having three papers (two in third semester and one in the fourth semester) from specialization 1, three papers (two in third semester and one in fourth semester from specialization 2.

Summer training for 6/8 weeks is compulsory for every student pursuing the course, which they have to undergo between second and third semester. Comprehensive Viva and Research project are part of the course. The case study shall be taught wherever required.

Evaluation of Papers

Every paper/course will carry maximum marks of 150(100 marks for semester examination and 50 marks for internal assessment, as per rules). Internal assessment will consist of two components (1) class test (30 marks) (2) Teacher assessment (20 marks). However, in subject NMBA 017 and NMBA 018, class test component will be consist of 15 marks for class test and 15 marks for presentation (NMBA 017) and practicals (NMBA 018). There will be no internal assessment in case of summer training project report (NMBA 035), Research project Report (NMBA 045) and comprehensive viva voce examination (NMBA 029 and NMBA 046). Question papers in semester examination will be divided into the following three parts:

Part 1: 20 marks

Containing six questions from the total syllabus out of which five are needed to attempt.

Part 2: 30 marks

Containing a case study or practical problem or numerical as relevant in the subject, in case of case problem, only one case will be given which will be compulsory. However, there may be maximum two practical problems or numerical with similar number of internal choices.

Part 3: 50 marks

Containing five questions, one from each unit, with one internal choice in each question.

Summer training project report

1. At the end of second semester examination, every student of MBA will undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students
2. During the training, the student is expected to learn about the organization and analyse and suggest solutions of a live problem. The objective is to equip the student with the knowledge of actual functioning of the organization and problems faced by them for exploring feasible solutions and suggestions.
3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project of the student.
4. The student, after the completion of training will submit a report to the college/institute which will form part of third semester examination. However, the report must be submitted by the end of august during third semester so that it is evaluated well in time and third semester results are not delayed.
5. The report (based on training and the problem/project studied) prepared by the student will be known as summer training project report. The report should ordinarily be based on primary dat. It should reflect in depth study of micro problem, ordinarily assigned by the organization where student undergoes training. Relevant tables and bibliography should support it.

One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. This chapter will form part 1 of the report. Part 2 of the report will contain the study of micro research problem. The average size of report ordinarily will be of 100 to 150 typed pages in standard font size (12) and double spacing. Three neatly typed and soft bound (paper back) copies of the report will be submitted to the college/institute. The report will be typed in A-4 size paper.

6. The report will have two certificates. One by the head of the institute/college and the other by the reporting officer of the organization where the student has undergone training. These two certificates should be attached in the beginning of the report.
7. The report will be evaluated by two external examiners. It will carry total of 150 marks divided into written report of 100 marks and presentation of 50 marks. There will be no internal examiner. Only such person will evaluate the project report who has minimum three years of experience of teaching MBA classes in a college/University. Experience of teaching MBA classes as guest faculty shall not be counted.
8. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.

Research Project report

In fourth semester, the candidates will have to submit a Research Project report on a problem/topic (from the specialization areas) to be assigned by the department MBA under the supervision of a core faculty member of the department. The research project report will carry 150 marks. The evaluation of the project report will be done by two external examiners and will consist of (1) Evaluation of project report (100 marks) (2) viva on Project (50 marks). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to the third examiner. In such cases the average of two closer awards (given by three examiners) will be taken into account for the results.

The report will contain the objectives and scope of the study. Research Methodology, use, importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit three copies of the report to the Head of MBA program. The number of pages in the report will be 75 or more. The report should be typed in A-4 size paper.

Comprehensive Viva

The comprehensive viva voce is scheduled at the end of it at the end of 2 and 4 semesters in order to judge the understanding as well as application of the knowledge gained by the students by the end of 2nd and 4th semester of the course. This is also to see the articulation of what is being learnt by them. This is also to see the articulation of what is being learnt by them. The idea is to see that students are able to digest what is being taught in two full year and see their relevance not only in the practical field but also their inter relationship. The viva voce is of 100 marks each to be conducted by the external examiners appointed by the University.

NMBA 011: MANAGING ORGANIZATION **Max. Hours: 40**

Course Objective: *To familiarize the students with the basic concepts and principles of management. The students should clearly understand the definitions of different areas of management. This course will facilitate students to understand and describe specific theories related to perception, motivation, leadership, job design, and organizational change. Also this will help the student to demonstrate effective teamwork behavior by learning the concept of group dynamics and conflict management. The course will help them evaluate methods of motivating and rewarding individuals & group and integrate individual, group, and organizational level concepts.*

UNIT I (9 sessions)
Evolution of Management Thought : Scientific Management, Classical Organization Theory School, Management Science School, Behavioral School, Systems Approach and Contingency Approach.
Concept of Management: Definition, Need, Concept and Nature of Management, Skills & Management Levels, Managing in Present Competitive Environment.

UNIT II (8 sessions)
Process of Management: Planning; Organizing- departmentalization, Line and Staff relationship; Directing; Coordinating & Controlling; Decision Making; Authority and Responsibility.

UNIT III (8 sessions)
Elements of Human Behavior at Work: Definition, Concept, Need, Importance and Foundations of Organizational Behavior, Personality, Perceptual Processes, Management and Behavioral applications of Personality, and Perception.

UNIT IV (6 sessions)
Psychological Variables and Communication Technology: Learning; Values and Attitudes; Motivation; Management and Behavioral Applications of Attitude and Motivation on Performance.

UNIT V (9 Sessions)
Leadership : Style and Functions of Leader, Transformational -Transactional, Charismatic-Visionary Leadership, Likert's Four Systems of Leadership and Managerial Grid.
Organisational Conflict: Concept, classification, process and conflict resolution strategies; **Organisational Culture:** Concept, Process and Implications of Organisational Culture; **Organisational Change:** Concept, Nature, Kurt Lewin Theory of Change, Implementing Change, Managing Resistance to Change.

SUGEESTED READING:
1. VSP RAO-Managing Organization (EXCEL 1 EDITION)

2. Chaturvedi& Saxena -Managing Organization (Himalaya Publication)

3. Stoner, Freeman & Gilbert Jr - Management (Prentice Hall of India, 6th Edition)

4 Robbins-Organization Behavior -15 e Prentice hall

5. Koontz Harold & Weihrich Heinz – Essentials of management (Tata Mc Graw Hill, 5th Edition 2008)

6. Newstrom John W. - Organizational Behaviour: Human Behaviour at Work (Tata Mc Graw Hill, 12th Edition)
7. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill,10th edition)
8. Mc Shane L. Steven, Glinow Mary Ann Von & Sharma Radha R. - Organizational Behaviour (Tata Mc Graw Hill, 4th Edition)

NMBA012:MANAGERIAL ECONOMICS

Max. Hours : 40

COURSE OBJECTIVE

The basic objective of this course is to make the students aware of the various economic issues that they are expected to face as managers at the corporate level and to equip them with the tools and techniques of economic analysis for improving their decision-making skills.

UNIT-I (6 Sessions)
Introduction to Economics; Nature and Scope of Management Economics, Significance in decision-making and fundamental concepts. Objectives of a firm. Gap between theory and practice and role of managerial economist.

UNIT-II (8 Sessions)
Demand Analysis; Law of Demand, Exceptions to the law of Demand, Determinants of Demand. Elasticity of Demand- Price, Income, Cross and Advertising Elasticity; Uses of Elasticity of Demand for managerial decision making, measurement of Elasticity of Demand. Demand forecasting meaning, significance and methods.

UNIT-III (10 Sessions)
Supply Analysis; Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making. Production concepts & analysis; Production function, single variable-law of variable proportion, two variable-Law of returns to scale. Cost concept and analysis, short-run and long-run cost curves and its managerial use.

UNIT-IV (12 Sessions)
Market Equilibrium and Average Revenue Concept. Market Structure: Perfect Competition, features, determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, product differentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership. Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetration pricing.

UNIT-V (6 Sessions)
National Income; Concepts and various methods of its measurement, Inflation, types and causes, Business Cycle, Profit concept and major theories of profits; Dynamic Surplus theory, Risk & Uncertainty bearing theory and Innovation theory.

Suggested Readings:

1. Dwivedi D.N. - Managerial Economics (Vikas Publication, 7th Edition)
2. Petersen/jain Managerial economics-4e (Prentice hall)
3. Raj Kumar-Managerial Economics(UDH PUBLISHERS, 2013 edition)
4. Damodaran Suma – Managerial Economics (Oxford 2006)
5. Atmanand- Managerial Economics (Excel Books)
6. Keats- Managerial economics-6e (Prentice hall)
7. Vanita Agarawal-Managerial Economics-Pearson
8. M.L. Jhingan & J.K. Stephan - Managerial Economics (Vrinda Publications 2nd Edition)
9. Singh- ManagerialEconomics (Wiley Dreamtech)
10. Hirschey Mark – Economics for Managers (Thomson, India Edition, 2007)

NMBA013: BUSINESS ACCOUNTING

Max. Hours: 40

COURSE OBJECTIVE:

The main objective of this course is to acquaint the students with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organisation. Further, it aims at familiarizing the student with those significant tools and techniques of financial analysis, which are useful in the interpretation of financial statements. These tools and techniques form an important part of management planning and control systems. Thus, the course does not intend to make the students expert accountant.

Unit I (6 Sessions)

Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Objectives of Accounting ,Matching of Indian Accounting Standards with International Accounting Standards.

Unit II (10 Sessions)

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; ledger posting and trial balance ,preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill

Unit III(8 Sessions)

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios; Common Size Statement; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.

Unit IV (8 Sessions)

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis;

Unit V (8 Sessions)

Cash Flow Statement: Various cash and non-cash transactions, flow of cash, difference between cash flow and fund flow, preparation of Cash Flow Statement and its analysis.

SUGGESTED READINGS

1) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management (Vikas, 10th Edition)
2) Ambrish Gupta - Financial Accounting: A Managerial Perspective (Prentice Hall, 4th Edition)
3) Narayanswami - Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
4) Mukherjee - Financial Accounting for Management (TMH, 1st Edition).
5) Banerjee-Financial Accounting(Excel Books)
6) Dhamija - Financial Accounting for managers: (Prentice Hall).
7) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).

NMBA014: BUSINESS ENVIRONMENT

Max. Hours: 40

COURSE OBJECTIVE:

The present course aims at familiarizing the participants with various aspects of economic, social, political and cultural environment of India. This will help them in gaining a deeper understanding of the environmental factors influencing Indian business organizations.

UNIT- I (6 Sessions)

Business Environment-Meaning, Importance, Environmental Factors, Recent Political Environment, Recent Economic and Financial Environment, Planning In India-Planning Commision-Liberalisation and Planning, Industrial Policy: New trade policy-1991 onwards, Industrial Licensing in India

UNIT-II (10 Sessions)

Indian Financial System : Monetary And Fiscal Policy,Economic Trends, Price Policy,Stock Exchange Of India,Role of regulatory instituions in Indian financial system – RBI and SEBI , National Income,Role of Industry in Economic Development, Foreign Trade and Balance of Payment,Poverty in India, Unemployment in India, Inflation, Human Development, Rural Development, Problems of Growth

UNIT-III (6 Sessions)

Direct & Indirect Taxes (MODVAT),(CENVAT),Competition Act 2002 & FEMA Acts ,Business Ethics, Corporate Governance, Philosophy and strategy of planning in India.

UNIT-IV (6 Sessions)

Liberalisation, Privatization and Disinvestments, Special Economic Zone (SEZ) and their role and impact in International Business Environment,World Trade Organisation (WTO), Redefining Value Preposition to MSMEs

UNIT-V (12 Sessions)

Social Responsibility of business enterprises, New Economic Policy, Globalization, EXIM policy and role of EXIM bank, FDI policy, Multinational Corporation (MNCs) and Transnational Corporations (TNCs), Global Competitiveness, technology and competitive advantage, technology transfer - importance and types, Appropriate technology and technology adaptation.

Suggested Readings:

1. Shaikh & Saleem - Business Environment (Pearson, 2nd Edition)
2. Francis Cherunilam – Business Environment, Text and Cases (Himalaya Publishing House, 8th Edition).
3. Mittal - Business Environment (Excel Books).
4. V. Neelamegam – Business Envirnoment (Vrinda Publications , 2nd Edition)
5. Fernando-Business Environment (Prentice hall)
6. Mishra S K & Puri V K - Economic Environment of Business (Himalaya Publishing House, 3rd Edition).
7. Paul Justin - Business Environment Text and Cases (Tata Mc Graw Hill).

NMBA015: BUSINESS STATISTICS

Max. Hours : 40

Course Objective

The objective of the course is to make the students familiar with basic statistical techniques and their applications in managerial decision making.

Unit I (8 Sessions)

Role of statistics: Applications of inferential statistics in managerial decision-making; Measures of central tendency: Mean, Median and Mode and their implications; Measures of Dispersion: Range, Mean deviation, Standard deviation , Coefficient of Variation (C.V.) , Skewness, Kurtosis.

Unit II (8 Sessions)

Time series analysis: Concept, Additive and Multiplicative models, Components of time series, Trend analysis: Least Square method - Linear and Non- Linear equations, Applications in business decision-making.

Unit III (10 Sessions)

Index Numbers:- Meaning , Types of index numbers, uses of index numbers, Construction of Price, Quantity and Volume indices:- Fixed base and Chain base methods.

Correlation:- Meaning and types of correlation, Karl Pearson and Spearman rank correlation.

Regression:- Meaning , Regression equations and their application , Partial and Multiple correlation & regression :- An overview.

Unit IV (8 Sessions)

Probability: Concept of probability and its uses in business decision-making; Addition and multiplication theorems; Bayes'Theorem and its applications.

Probability Theoretical Distributions: Concept and application of Binomial; Poisson and Normal distributions

Unit V (6 Sessions)

Estimation Theory and Hypothesis Testing: Sampling theory; Formulation of Hypotheses; Application of Z test, t-test, F-test and Chi-Square test. Techniques of association of Attributes & Testing.

SUGGESTED READINGS

1. Bhardawaz-Business Statistics (Excel Books)
2. Gupta C B, Gupta V - An Introduction to Statistical Methods (Vikas1995, 23rd Edition).
3. Black- Business Statistics (Wiley Dreamtech)
4. Sharma J K - Business statistics (Pearson education 2nd edition)
5. Render and Stair Jr - Quantitative Analysis for Management (Prentice-Hall, 7th edition)
6. Levin Rubin - Statistics for Management (Pearson 2000, New Delhi, 7th Edition).
7. Beri - Business Statistics (Tata Mc Graw Hill ,2nd Edition).
8. Chandan J S - Statistics for Business and Economics (Vikas 1998.Ist Edition).

NMBA 016: MARKETING MANAGEMENT

Max. Hours: 40

Course Objective:

This course intends to provide an experienced-based approach to marketing theory and its practical application. The course is designed to enable the students to learn the basic of marketing. Topics of the syllabus shall be addressed and discussed from an application oriented perspective

Unit I (8 Sessions)

Core Concepts of Marketing:

Concept, Meaning, definition, nature, scope and importance of marketing, Goods – Services Continuum, Product, Market, Approaches to Marketing – Product – Production - Sales – Marketing – Societal – Relational. Concept of Marketing Myopia, Holistic Marketing Orientation, Customer Value, Adapting marketing to new liberalised economy - Digitalisation, Customisation, Changing marketing practices

Unit II (12 Sessions)

Market Analysis and Selection:

Nature and Contents of Marketing Plan, Marketing environment, Controllable and Uncontrollable factors effecting marketing decisions, Analyzing latest trends in Political, Economic, Socio-cultural and Technical Environment, Concept of Market Potential & Market Share, Concept, Characteristics of consumer and organizational markets, Buyer Behavior, 5 step Buyer decision process

Meaning and concept of market segmentation, Bases for market segmentation, Types of market segmentation, Effective segmentation criteria, Evaluating & Selecting, Target Markets, Concept of Target Market, Positioning and differentiation strategies, Concept of positioning – Value Proposition & USP, Marketing Information System, Strategic marketing planning and organization.

Unit III (6 Sessions)

Product Decision- Concept of a product; Classification of products; Major product decisions; Product line and product mix; Branding; Packaging and labeling; Product life cycle – strategic implications; New product development and consumer adoption process.

Unit IV (6 Sessions)

Price Decision- Concept, and Meaning of Price and Pricing, Significance of Pricing Decision, Factors affecting price determination; Pricing Methods and Techniques, Pricing policies and strategies; Discounts and rebates.

Unit V (8 Sessions)

Place Decision- Nature, functions, and types of distribution channels; Distribution channel intermediaries; Channel management decisions, Marketing channel system - Functions and flows; Channel design, Channel management - Selection, Training, Motivation and evaluation of channel members; Promotion Decision- Communication Process; Promotion mix – advertising, personal selling, sales promotion, publicity and public relations; Media selection; Advertising effectiveness; Sales promotion – tools and techniques.

Suggested Readings

1. Philip Kotler-Agnihotri : Principle of marketing 13 e, Pearson Education

2. Ramaswamy V.S. and Namakumari S - Marketing Management: Planning, Implementation and Control (Macmillian, 3rd Edition).

3. Rajan Saxena: Marketing Management, Tata McGraw Hill.

4. R Kumar& Goel-Marketing Management(UDH Publishers, edition 2013).

5. Tapan Panda : Marketing Management, (ExcelBooks)

6. Stanton William J - Fundamentals of Marketing (TATA Mc Graw Hill)

7. Etzel M.J., Walker B.J. and Stanton William J - Marketing concept & Cases special Indian Edition (Tata Mc Graw Hill, 13th Edition).

NMBA 017: COMMUNICATION FOR MANAGEMENT **Max. Hours : 40**

Course Objective

This course intends to develop good communication skills in students for their future jobs and endeavors in the corporate
word so that they can gain a cutting edge over their other counterparts within the country and across the globe.

UNIT I (6 Session)

INTRODUCTION: Definition and classification of communication, purpose of communication, process of communication, importance of communication in management, communication structure in organization, barriers & gateway in communication, 7 C's of communication, Impact of cross cultural communication.

UNIT II (8 Session)

EMPLOYMENT COMMUNICATION: Writing CVs & Application Letter, Group discussions, interview, types of interview, candidates preparation, Interviewers preparation; Impact of Technological Advancement on Business Communication; Communication networks, Intranet, Internet, teleconferencing, videoconferencing

ORAL COMMINICATION: What is oral Communication, principles of successful oral communication, two sides of effective oral communication, effective listening, non–verbal communication, Body language, Paralanguage.

UNIT III (8 Session)

WRITTEN COMMUNICATION: Purpose of writing, pros & cons of written communication, clarity in writing, principles of effective writing, writing technique.

BUSINESS LETTERS AND REPORTS: Introduction to business letters, Types of business letter, Layout of business letter, Reports: definition & purpose, types of business reports, reports writing.

UNIT IV (10 Session)

GROUP COMMUNICATION- Meetings: need, importance & planning of Meetings, drafting of notice, agenda, minutes & resolutions of Meeting, writing memorandum, press release, press conference, Business etiquettes – netiquettes, telephonic & table etiquettes.
PRESENTATION SKILLS :What is a presentation: elements of presentation, designing a presentation, advanced visual support for
business presentation, types of visual aid, appearance & posture, practicing delivery of presentation.

UNIT V (8 Session)

CORPORATE COMMUNICATION :Definition, scope, importance & components of corporate communication, professional communicator responsibilities, corporate communication & Public Relation, role of social media in communication.

RECOMMENDED BOOKS:

1. Lesikar RV & Pettit Jr. JD – Basic Business Communication : Theory & Application (Tata Mc Grow Hill, 10th Edition).
2. Bisen & Priya – Business Communication (New Age International Publication)
3. Kalkar,Suryavanshi,Sengupta-Business Communication(Orient Blackswan)
4. M.K. Sehgal & V. Khetrapal - Business Communication (Excel Books).
5. P.D. Chaturvedi – Busines Communication (Pearson Education, 3st Edition 2006).
6. Sharma R.C., Mohan Krishna – Business : Correspondence and Report Writing (Tata McGraw Hill, 3rd Edition).
7. Rajendra Pal - Business Communication (Sultanchand & Sons Publication).

NMBA 018: Fundamentals of Computers & Information System

Max. Hours: 40

COURSE OBJECTIVE:

The objective of this course is to acquaint the students with the application of computers in understanding latest trends in information technology. This course will also provide an orientation about the increasing role of management information system in managerial decision making with the help of computers and how information is processed, stored and utilized.

Unit I (10 Sessions)

Hardware: (a) Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display Unit, printers, plotters etc.(c) Storage Devices – Magnetic storage devices, Optical storage devices, Flash Memory etc.

Software: Introduction; Types of software with examples; Introduction to languages, compiler, interpreter and assembler.

Operating System: Definition, Functions, Types and Classification, Elements of GUI based operating system-Windows-Use of menus, tools and commands of windows operating system.

Unit II (10 Sessions)

Use of MS-Office: Basics of MS-Word, MS-Excel and MS-PowerPoint; MS Access: Overview of MS-Access. Creating tables, queries, forms and reports in MS-Access. Computer Networks: Overview of Computer Network, Types of computer networks (LAN, WAN and MAN), Network topologies, Internet: Overview of Internet, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher etc., IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail, Web browsing, searching, downloading & uploading from Internet. Applications of Information Technology.

Unit III (8 Sessions)

MIS Introduction: Concept of Data and Information, Information Systems, Classification, Operations Support System (OSS), Management Support System(MSS), Transaction Processing System(TPS), Process Control System(PCS), Enterprise Collaboration System(ECS), Management Information System(MIS), Decision Support System(DSS).

Artificial Intelligence(AI) , Applications Of Artificial Intelligence : Neural Networks, Fuzzy Logical Control System, Virtual Reality , Expert System(ES), Executive Information System(EIS), Cross Functional Information Systems.

Unit IV (6 Sessions)

Developing MIS Systems: System Development Life Cycle. , Investigation Phase, Prototyping, Feasibility Analysis, System Analysis (DFD and ER Diagram), System Design, Implementing Business Systems, Testing, Documenting, Training, Conversion and Maintenance

Unit V (6 Sessions)

Applications: Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges Of IT, Ethical Responsibility - Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues.

Suggested Readings

1. Shrivastava-Fundamental of Computer& Information Systems (Wiley Dreamtech)
2. Leon A and Leon M - Introduction to Computers (Vikas, 1st Edition).
3. ITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
4 ITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
5. Introduction to Computers, Norton P. (TATA McGraw Hill)
6. Leon - Fundamentals of Information Technology, (Vikas)

NMBA 021: MANAGING HUMAN RESOURCES

Max. Hours : 40

Objectives: *The objective of this course is to endow the student with a broad perspective on themes and issues of Human Resource Management along with their relevance and application in the Indian prospect. It will help the students to build up and refine decision making skills so that they can help organizations effectively conduct personnel management and employee relations.*

UNIT I (6 Sessions)

Human Resources Management (HRM) : Meaning, Nature and Scope, Difference between HRM and Personnel Management, HRM functions and objectives, Evolution of HRM environment – external and internal.

UNIT II (8 Sessions)

Human Resources Development in India: evolution and principles of HRD, HRD Vs. Personnel functions, Role of HR managers. Strategic Human Resource Management : Nature of Strategies and Strategic Management, Strategic Management Process – Environmental Scanning, Strategy Formulation, implementation and evaluation.

Human Resources planning: Definition, purposes, processes and limiting factors; Human Resources Information system (HRIS): HR accounting and audit.

UNIT III (10 Sessions)

Job Analysis – Job Description, Job Specification. The systematic approach to recruitment: recruitment policy, recruitment procedures, recruitment methods and evaluation. The systematic approach to selection: the selection procedure, the design of application form, selection methods, the offer of employment, and evaluation of process.

Training and Development: Purpose, Methods and issues of training and management development programmes.

UNIT IV (8 Sessions)

Performance Appraisal: Definition, Purpose of appraisal, Procedures and Techniques including 360 degree Performance Appraisal, Job Evaluation. Compensation Administration: Nature and Objectives of compensation, components of pay structure in India,

Wage Policy in India – Minimum Wage, Fair Wage and Living Wage.Incentive Payments : Meaning and Definition, Prerequisites for an effective incentive system, Types and Scope
of incentive scheme, Incentive Schemes in Indian Industries, Fringe Benefits.

UNIT V (8 Sessions)

Discipline and Grievance Procedures: Definition, Disciplinary Procedure, Grievance Handling Procedure. Industrial Relations: Nature, importance and approaches of Industrial Relations.

Promotion, Transfer and Separation: Promotion – purpose, principles and types; Transfer – reason, principles and types; Separation – lay-off, resignation, dismissal, retrenchment, Voluntary Retirement Scheme.

Suggestion Readings :

1. Bhattacharyya – Human Resource Management, Text and Cases (Excel Books, .),
2.Aswathappa K - Human Resource and Personnel Management (Tata McGraw Hill, 5th Ed.).
3 Decenzo- Human Resource Management (Wiley Dreamtech)
4 Dessler – Human Resource Management (Pearson Education, 13th Ed.)
5. Ivansevich – Human Resource Management (Tata McGraw Hill, 10th Ed.)
6. Mondy – Human Resource Management (Prentice hall, 10th Ed.)
7. Bernardi – Human Resource Management (Tata McGraw Hill, 4th Ed.)
8. Singh. Nisha - Human Resource Management (Himalaya Publication)

NMBA 022: BUSINESS LAWS **Max. Hours: 40**

Course Objective:

The present course aims at familiarizing the participants with various legal aspects of business. It aims at providing a rich fund of contemporary knowledge , time tested principles, basic concepts, emerging ideas, evolving theories, latest technique , ever changing procedures & practices in the field of Law in a comprehensive way .

UNIT 1 (10 SESSIONS)

The Indian Contract Act, 1872

Definition of a Contract and its essentials, Formation of a valid Contract - Offer and Acceptance, Consideration, Capacity to Contract, Free consent, Legality of object, Discharge of a Contract by performance, Impossibility and Frustration, Breach, Damages for breach of a contract, Quasi contracts. **Special Contracts** Contract of Indemnity and Guarantee, Contract of Bailment and Pledge, Contract of Agency.

UNIT II (08 SESSIONS)

The Indian Partnership Act, 1932

Definition of Partnership and its essentials, Rights and Duties of Partners: Types of Partners, Minor as a partner, Doctrine of Implied Authority, Registration of Firms, Dissolution of firms.

Limited Liability Partnership Act, 2000

Incorporation by registration, Relationship of members, members as agents, ex- members, designated members, Cessation of trade by Limited liability partnership, Insolvency and winding up

UNIT III (08 SESSIONS)

The Sale of Goods Act, 1930

Definition of a Contract of Sale, Conditions and Warranties, Passing of Property, Right of Unpaid Seller against the Goods, Remedies for Breach.

The Negotiable Instrument Act, 1881

Definition and characteristics, Kinds of negotiable instruments, Promissory Note, Bill of Exchange and Cheques, Holder and Holder in due course, Negotiation, Presentment, Discharge from Liability, Noting and Protest, Presumption, Crossing of Cheques, Bouncing of Cheques.

UNIT IV (06 SESSIONS)

The Companies Act, 1956

Nature and Definition of a Company, Registration and Incorporation, Memorandum of Association, Articles of Association, Prospectus, Kinds of Companies, Directors: Their powers and duties, Meetings, Winding up.

The Consumer Protection Act, 1986

Aims and Objects of the Act, Redressal Machinery under the Act, Procedure for complaints under the Act, Remedies, Appeals, Enforcement of orders and Penalties.

UNIT V (8 Sessions)

The Information Technology Act, 2000

Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.

The Right to Information Act, 2005

Right to know, Salient features of the Act, obligation of public Authority, Designation of Public Information officer, Request for obtaining information, Duties of a PIO, Exemption from disclosure of information, Partial disclosure of information, In formation commissions, powers of Information Commissions, Appellate Authorities, Penalties, Jurisdiction of courts.

Suggested Readings

1. Kuchhal M.C. - Business Law (Vikas Publication, 4 th Edition)
2. Gulshan S.S. - Business Law Including Company Law (Excel Books)
3. Avtar Singh - Principles of Mercantile Law (Eastern Book Company, 7th Edition).
4. N.D Kapoor & Rajni Abbi-General Laws & Procedures (Sultan Chand & Sons)
5. Durga Das Basu- Constitution of India (Prentice Hall of India)
6. Relevant Acts

NMBA 023: CUSTOMER RELATIONSHIP MANAGEMENT **Max. Hrs: 40**

Course Objective:

The paper is designed to impart the skill based knowledge of Customer Relationship Management. The syllabus encompasses almost the entire aspect of the subject. The purpose of the syllabus is to not just make the students aware of the concepts and practices of CRM in modern businesses but also enable them to design suitable practices and programs for the company they would be working.

UNIT I (8 Sessions)

Customer Relationship Management Fundamentals- Theoretical perspectives of relationship, Evolution of relationship marketing, Stages of relationship, Issues of relationship, Purpose of relationship marketing, Approach towards marketing: A paradigm shift, Historical Perspectives, CRM Definitions, Emergence of CRM practice:, CRM cycle, Stakeholders in CRM, Significance of CRM, Types of CRM, Success Factors in CRM, CRM Comprehension, CRM Implementation

UNIT II (8 Sessions)

Customer Satisfaction: Meaning, Definition, Significance of Customer Satisfaction, Components of Customer Satisfaction, Customer Satisfaction Models, Rationale of Customer Satisfaction, Measuring Customer Satisfaction, Customer satisfaction and marketing program evaluation, Customer Satisfaction Practices, Cases of Customer Satisfaction

UNIT III (8 Sessions)

Service Quality: Concept of Quality, Meaning and Definition of Service Quality, Factors influencing customer expectation and perception, Types of Service Quality, Service Quality Dimensions, Service Quality Gaps, Measuring Service Quality, Service Quality measurement Scales

UNIT IV (8 Sessions)

Customer Relationship Management: Technology Dimensions - E- CRM in Business, CRM: A changing Perspective, Features of e-CRM, Advantages of e-CRM, Technologies of e-CRM, Voice Portals, Web Phones, BOTs, Virtual Customer Representative, Customer Relationship Portals, Functional Components of CRM, Database Management: Database Construction, Data Warehousing, architecture, Data Mining. Characteristics, Data Mining tools and techniques, Meaning, Significance, Advantages, Call Center, Multimedia Contact Center, Important CRM softwares.

UNIT V (8 Sessions)

Customer Relationship Management: Emerging Perspectives: Employee-Organisation Relationship, Employee- Customer Linkage, Factors effecting employee's customer oriented behavior, Essentials of building employee relationship, Employee customer orientation, Service Failure, Service Recovery Management, Service Recovery Paradox, Customer Life time value, customer profitability, customer recall management, customer experience management, Rural CRM, , customer relationship management practices in retail industry, hospitality industry, banking industry, telecom industry, aviation industry

Suggested Readings

1. Alok Kumar Rai : Customer Relationship Management: Concepts and Cases (Second Edition)-PHI Learning
2. Simon Knox, Adrian Payne, Stan Maklan: Customer Relationship Management- Routledge Inc.
3. Bhasin- Customer Relationship Management (Wiley Dreamtech)
4. Dyche- Customer relationship management handbook prentice hall
5. Peelan-Customer relationship management prentice hall
6. Kristin Anderson, Carol Kerr : Customer relationship management, McGraw-Hill Professional
7. Chaturvedi-Customer Relationship Management(Excel Books)
8. Sheth J N, Parvatiyar A. and Shainesh G. : Customer relationship management: , Emerging Concepts, Tools, & Applications, Tata McGraw-Hill Education
9. Lumar- Customer Relationship Management (Wiley India)

NMBA 024: FINANCIAL MANAGEMENT

Max. Hours : 40

Course Objective

The present course aims at familiarizing the participants with the skills related to basic principles, tools and techniques of financial management.

Unit I (6 Sessions)

Concept of Finance, scope and objectives of finance, Profit maximization vs. Wealth maximization, Functions of Finance Manager in Modern Age, Concept of Risk and Return

Unit II (8 Sessions)

Capital Budgeting Decisions, Calculation of NPV and IRR,Cost of Capital,Concept of Opportunity Cost, Cost of Preference and Equity capital, Cash Flows as Profit and components of Cash Flows

Unit III (10 Sessions)

Capital Structure, Relevance and Irrelevance of Capital Structure, Trade-off Theory, Pecking order Theory, Leverage analysis – financial, operating and combined leverage along with its implications, Dividend Relevance: Walter and Gordon Model,Miller-Modigilani(MM) Hypothesis,Linter Model of Corporate Dividend Behaviour,Forms of Dividends

Unit IV (10 Sessions)

Concepts of Working Capital, Operating and Cash Conversion Cycle, Permanent and Variable Working Capital, Determinants of Working Capital, Trade Credit, Accrued Expenses and Deferred Income, Bank Finance for Working Capital

Unit V (6 Sessions)

Nature, Need, Objective of Inventory Management, Inventory Management Techniques, Inventory Control Systems, Factoring, Facets of Cash Management, Motives for Holding Cash

SUGGESTED READINGS:

1) Pandey I M - Financial Management (Vikas, 2004, 10th Ed.)
2) Van Horne - Financial Management and Policy (Prentice hall, 2003, 12th Ed.)
3)Shapiro- Multinational Financial Management (Wiley Dreamtech)
4)Sheeba kapil-Fundamental of financial management (Pearson)
5) Khan and Jain - Financial Management (Tata McGraw Hill, 3rd Ed.)
6) Prasanna Chandra - Fundamentals of Financial Management (TMH, 2004)
7) Knott G - Financial Management (Palgrave, 2004)
8) Lawrence J.Gitman – Principles of Managerial Finance (Pearson Education, 2004)
9) R P Rustagi - Financial Management (Galgotia, 2000, 2nd revised ed.)

NMBA 025: OPERATIONS RESEARCH

Max. Hours: 40

COURSE OBJECTIVE

This Course is designed to develop a deeper understanding of the quantitative techniques, which could be successfully used for improving the quality of managerial decisions. The students will study this course with a generalist approach and avoid the minor details of the topics prescribed hereunder:

Unit I (6 Sessions)
Operations Research:- Uses, Scope and Applications of Operation Research in managerial decision-making.
Decision-making environments:- Decision-making under certainty, uncertainty and risk situations; Decision tree approach and its applications.

Unit II (8 Sessions)
Linear programming: Mathematical formulations of LP Models for product-mix problems; graphical and simplex method of solving LP problems; sensitivity analysis; duality.
Transportation problem: Various methods of finding Initial basic feasible solution and optimal solution.

Unit III (10 Sessions)
Assignment model: Algorithm and its applications.
Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point; Odds Method; Dominance Method and Graphical Method for solving Mixed Strategy Game.

Unit IV (10 Sessions)
Sequencing Problem: Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m - Machines Problems.
Queuing Theory: Characteristics of M/M/I Queue model; Application of Poisson and Exponential distribution in estimating arrival rate and service rate; Applications of Queue model for better service to the customers.

Unit V (6 Sessions)
Replacement Problem: Replacement of assets that deteriorate with time, replacement of assets which fail suddenly.
Project Management: Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations.

SUGGESTED READINGS:
1) Apte-Operation Research and Quantitative Techniques (Excel Books)
2) S Kalawathy-Operation Research (Vikas IVth Edition)
3) Natarajan- Operation Research(Pearson)
4) Singh & Kumar—Operation Research(UDH Publisher edition 2013)
5) Taha Hamdy - Operations Research - An Introduction (Prentice-Hall, 9th edition)
5) Vohra - Quantitative Techniques in Management (Tata McGraw-Hill, 2nd)
6) Kothari - Quantitative Techniques (Vikas 1996, 3rd Edition).
7) Sharma J K - Operations Research (Pearson, 3rd Edition)

NMBA 026: COST & MANAGEMENT ACCOUNTING

Max. Hours : 40

COURSE OBJECTIVE:

The objective of this course is to expose the students to the applied aspect of accounting and making them familiar with the techniques of using Accounting information for decision making. Having been introduced to these techniques and having acquired the ability to understand accounting language, the students should be in a position to make effective use of accounting information in resolving the problems, which they may face as managers. Applied side of the subject will be given more emphasis and attentions compared to its conceptual aspect.

Unit I (8 Sessions)

Introduction: Accounting for Management, Role of Cost in decision making, Comparison of Management Accounting and Cost Accounting, types of cost, cost concepts, Elements of cost - Materials, Labour and overheads and their Allocation and Apportionment, preparation of Cost Sheet, Methods of Costing, Reconciliation of Cost and Financial Accounting.

Unit II (8 Sessions)

Marginal Costing: Marginal Costing versus Absorption Costing, Cost-Volume-Profit Analysis and P/V Ratio Analysis and their implications, Concept and uses of Contribution & Breakeven Point and their analysis for various types of decision-making like single product pricing, multi product pricing, replacement, sales etc.

Unit III (10 Sessions)

Differential Costing and Incremental Costing: Concept, uses and applications, Methods of calculation of these costs and their role in management decision making like sales, replacement, buying etc.

Budgeting: Concept of Budget, Budgeting and Budgetary Control, Types of Budget, Static and Flexible Budgeting, Preparation of Cash Budget, Sales Budget, Production Budget, Materials Budget, Capital Expenditure Budget and Master Budget, Advantages and Limitations of Budgetary Control.

Unit IV (8 Sessions)

Standard Costing: Concept of standard costs, establishing various cost standards, calculation of Material Variance, Labour Variance, and Overhead Variance, and its applications and implications.

Neo Concepts for Decision Making: Activity Based Costing, Cost Management, Value Chain Analysis, Target Costing & Life Cycle Costing : concept, strategies and applications of each.

Unit V (6 Sessions)

Responsibility Accounting & Transfer Pricing: Concept and various approaches to Responsibility Accounting, concept of investment center, cost center, profit center and responsibility center and its managerial implications, Absorption Costing.

SUGGESTED READINGS:

1. Pandey I M - Management Accounting (Vikas, 2004, 3rd Ed.)
2. Vij-Management Accounting (Excel Books)
3. Balakrishnan _ Managerial Accounting (Wiley Dreamtech)
4. Alex –Cost Accounting (Pearson)
5. Khan and Jain - Management Accounting (Tata McGraw-Hill, 2000)
6. Sinha- Accounting and Costing for Management (Excel Books)
7. Horngren et al - Introduction to Management Accounting (Prentice hall, 2002, 12th edition)

NMBA 027: OPERATIONS MANAGEMENT

Max. Hours: 40

COURSE OBJECTIVE:

The course is designed to make the students familiar with different types of Production, plant layout and material handling, operations planning and control, inventory management, quality management etc. and to acquaint them with appropriate tools and techniques needed for understanding the operational situation and also understanding the logistics management.

Unit –I (6 sessions)
Operations Management – An overview, Definition of production and operations management, Production Cycle, Classification of operations, New Product Development, Product Design, Plant Location, Layout Planning.

Unit –II (8 sessions)
Forecasting as a planning tool, Forecasting types and methods, Exponential smoothening, Measurement of errors, Monitoring and Controlling forecasting models, Box- Jenkins Method. Productivity and Work study, Method study, Work Measurement.
Basic Concept & Philosophy of Supply Chain Management*;* Essential features, Various flows (cash, value and information)

Unit-III (8 sessions)

Recent Issues in SCM : Role of Computer / IT in Supply Chain Management, CRM Vs SCM, Benchmarking concept, Features and Implementation, Outsourcing-basic concept, Value Addition in SCM-concept of demand chain management.
Production Planning techniques, Routing Decisions, Line of Balance, Scheduling types & principles, master production schedule.

Unit-IV (8 sessions)
Inventory Management – Objectives, Factors, Process, Inventory control techniques- ABC, VED, EOQ, SED,FSN analysis. Basic concepts of quality, dimensions of quality, Juran’s quality trilogy, Deming’s 14 principles, PDCA cycle, Quality circles, Quality improvement and cost reduction- 7QC tools and 7 new QC tools, ISO 9000-2000 clauses, coverage QS 9000 clauses, coverage. Six Sigma, Total Productive Maintenance (TPM)

Unit-V (10 sessions)
Logistics Management: Logistics as part of SCM, Logistics costs, different models, logistics sub-system, inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management.
Purchasing & Vendor management: Centralized and Decentralized purchasing, functions of purchase department and purchase policies. Use of mathematical model for vendor rating / evaluation, single vendor concept, management of stores, accounting for materials.

SUGGESTED READING:

1. MUHLEMANN: Production & Operation management (PEARSON)
2. Bisen& Singh-Operation & Logistics Management(Excel Books)
3. R.V.Badi & N.V. Badi - Production & Operation Management (Vrinda Publications 3rd Edition)
4. Chary - Production and Operations Management (Tata McGraw-Hill, 1997, 9th Edition)
5. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Ed.)
6. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
7. Adam Jr Everetl E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)

NMBA 028 :RESEARCH METHODOLOGY

Max. Hours: 40

COURSE OBJECTIVE: The objective of this course is to develop the research skills of the students in investigating into thebusiness problems with a view to arriving at objective findings and conclusions and interpreting the results of their investigation inthe form of systematic reports.

UNIT I (8 Sessions)

Introduction: Concept of Research and Its Application in Various Functions of Management, Types of Research, Types of Business Problems Encountered by the Researcher, Problems and Precautions to the Researchers.

UNIT II (6 Sessions)

Process of Research: Steps Involved in Research Process. Research Design : Various Methods of Research Design, Collection of Data.

UNIT III (8 Sessions)

Concept of Sample, Sample Size and Sampling Procedure, Various Types of Sampling Techniques, Determination and Selection of Sample Member, Types of Data: Secondary and Primary, Various Methods of Collection and Data, Preparation of Questionnaire

and Schedule, Types of Questions, Sequencing of Questions, Check Questions, Length of Questionnaire, Precautions in Preparation of Questionnaire and Collection of Data.

UNIT IV (10 Sessions)

Analysis of Data: Coding, Editing and Tabulation of Data, Various Kinds of Charts and Diagrams Used in Data Analysis: Bar and Pie Diagrams and their Significance, Use of SPSS in Data Analysis, Application and Analysis of Variance (ANOVA). Measurement and Central Tendency, Measure of Dispersion and their Advantages.

UNIT V (8 Sessions)

Report Preparation: Types and Layout of Research Report, Precautions in Preparing the Research Report. Bibliography and Annexure in the Report : Their Significance, Drawing Conclusions, Suggestions and Recommendations to the Concerned Persons.

Suggested Readings:

1.Kothari C R – Research Methodology Methods & Techniques (New Age International Publishers)
2 Saunders - Research Methods for Business students (Prentice hall, 2nd Edition, 2007)
2. Cooper and Schindler - Business Research Methods (Tata Mc Graw Hill, 9th Edition)
3. C. Murthy- Research Methodology (Vrinda Publications)
4. Bhattacharyya-Research Methodology(Excel Books)
5. Panneer Selvam - Research Methodology (Prentice Hall of India, Edition 2008)
6. Gravetter - Research Method for Behavourial Sciences (Cengage Learning)

NMBA 031: ENTREPRENEURSHIP DEVELOPMENT

Max. Hours: 40

Objective: The objective of the section is to develop conceptual understanding of the topic among the students and comprehend the environment of making of an Entrepreneur. Specific topics to be covered in the section are as follows:

Unit I (8 Sessions)

Meaning, Definition and concept of Enterprise, Entrepreneurship and Entrepreneurship Development, Evolution of Entrepreneurship, Theories of Entrepreneurship. Characteristics and Skills of Entrepreneurship, Concepts of Intrapreneurship, Entrepreneur v/s Intrapreneur, Entrepreneur Vs. Entrepreneurship, Entrepreneur Vs. Manager, Role of Entrepreneurship in Economic Development, Factors affecting Entrepreneurship, Problems of Entrepreneurship

Unit II (6 Sessions)

Meaning and concept of Entrepreneurial Competency, Developing Entrepreneurial Competencies, Entrepreneurial Culture, Entrepreneurial Mobility, Factors affecting Entrepreneurial mobility, Types of Entrepreneurial mobility. Entrepreneurial Motivation: Meaning and concept of Motivation, Motivation theories, Entrepreneurship Development Program: Needs and Objectives of EDPs, Phases of EDPs, Evaluation of EDPs

Unit III (10 Sessions)

Role of Government in promoting Entrepreneurship, MSME policy in India, ***Agencies for Policy Formulation and Implementation:*** District Industries Centers (DIC), Small Industries Service Institute (SISI), Entrepreneurship Development Institute of India (EDII), National Institute of Entrepreneurship & Small Business Development (NIESBUD), National Entrepreneurship Development Board (NEDB), ***Financial Support System:*** Forms of Financial support, Long term and Short term financial support, Sources of Financial support, Development Financial Institutions, Investment Institutions

Unit IV (8 Sessions)

Women Entrepreneurship: Meaning, Characteristic features, Problems of Women Entrepreneurship in India, Developing Women Entrepreneurship in India, Concept of Social Enterprise and Social Entrepreneurship, Social Entrepreneurs, Sustainability Issues in Social Entrepreneurship, Rural Entrepreneurship, Family Business Entrepreneurship, Concepts of Entrepreneurship Failure, Issues of Entrepreneurial failure, Fading of Entrepreneurial success among once leading corporate groups, Entrepreneurial resurgence, Reasons of Entrepreneurial Failure, Essentials to Avoid Unsuccessful Entrepreneurship.

Unit V (8 Sessions)

Forms of Business Ownership, Issues in selecting forms of ownership, Environmental Analysis, Identifying problems and opportunities, Defining Business Idea, Planning Business Process, **Project Management:** Concept, Features, Classification of projects, Issues in Project Management, Project Identification, Project Formulation, Project Design and Network Analysis, Project Evaluation, Project Appraisal, Project Report Preparation, Specimen of a Project Report

Suggested Readings:

1. Lall &Sahai:Entreprenurship(Excel Books 2 edition)
2. Couger, C- Creativity and Innovation (IPP, 1999)
3. Kakkar D N - Enterpreneurship Development(Wiley Dreamtech)
4. A.K.Rai – Entrepreneurship Development, (Vikas Publishing)
5. Sehgal & Chaturvedi-Entrepreneurship Development(UDH Publishing edition 2013)
6. R.V. Badi & N.V. Badi - Entrepreneurship (Vrinda Publications, 2nd Edition)
7. Holt - Entrepreneurship : New Venture Creation (Prentice-Hall) 1998.
8. Barringer M J - Entrepreneurship (Prentice-Hall, 1999)
9. Nina Jacob, - Creativity in Organisations (Wheeler, 1998)

NMBA 032: INTERNATIONAL BUSINESS MANAGEMENT **Max. Hours: 40**

Course Objective

This course will provide the students an opportunity to learn and understand how business is conducted in the international arena. The syllabus is designed to allow students to gain managerial skills to meet the challenges they will face in the global workplace.

Unit I (6 sessions)

An Overview of International Business: Introduction, Definition of International Business, Changing Environment of International Business, Globalization of Markets, Trends in Globalization, Effects and Benefits of Globalization.

Unit II (10 sessions)

International Trade and Investment Theories: Mercantilism; Absolute Cost theory, Comparative Cost theory, Opportunity Cost theory, factor endowment theory, Complimentary trade theories – stopler – Samuelson theorem, International Product life Cycles. Investment Theories – Theory of Capital Movements, Market Imperfections theory; Internationalisation Theory; Location Specific Advantage Theory; Eclectic Theory; other theories, Instruments of Trade Policy- Tariffs, Subsidies, Import Quotas, Voluntary Export Restraints, Administrative Policy, Anti-dumping Policy.

Unit III (08) sessions)

Foreign Exchange Determination Systems: Basic Concepts Relating to Foreign Exchange, Various types of Exchange Rate Regimes – Floating Rate Regimes, Managed Fixed Rate Regime, Purchasing Power Parity, Mint Parity, Interest rates, other Factors Affecting Exchange Rates, Brief History of Indian Rupees Exchange Rates.

Unit IV (10 Sessions)

International Institution: UNCTAD, Its Basic Principles and Major Achievements, IMF, Role of IMF, IBRD, Features of IBRD, WTO, Role and Advantages of WTO.

Regional Economic Integration: Introduction, Levels of Economic Integration, Regional Economic Integration in Europe, Regional Economic Integration in U.S.A., ASEAN, SAARC, Integration for Business.

Unit V (06 Sessions)

Strategic Functions of International HRM, Staffing Policy – Ethnocentric, Polycentric and Geocentric Approach, Expatriate Preparation and development, Expatriate Repatriation, International Labor Relations

SUGGESTED READINGS

1) Agarwal Raj - International Trade (Excel, 1st Ed.)
2) Albaum Duerr - International Marketing and Export management (Pearson, 7th Ed.)
3) Cherunilam F - International Trade and Export Management (Himalaya, 2007)
4) Hill C.W. - International Business (TMH, 5th Ed.)
5) Daniels - International Business (Pearson, 1st Ed.)
6) Kumar R and Goel, International Business, (UDH Publications, edition 2013)
7) Jaiswal- International Business (Himalya Publication)
8) Varshney R.L, Bhattacharya B - International Marketing Management (Sultan Chand & Sons, 9th Ed.)

NMBA 033: RURAL DEVELOPMENT **Max. Hours : 40**

Course Objective

The objective of the course is to familiarize the participants with conceptual understanding of Rural Marketing and development practices in Indian context.

Unit I (08 Sessions)

Rural Business and its critical features; Identification of needs of rural producer organization, enterprises, projects and its people; the rural social and political scenario. Features of structure dynamics and changes of rural society and polity in India in post-independence period.

Unit II (10 Sessions)

Overview of the rural resources-land, soil, climate, water and forests; Overview of the production system containing agriculture, horticulture, seri-culture, forestry, animal husbandry and dairying, fisheries, non-farm activities. Concept, processes and relationship among agro climate and natural resources, production system and livelihood of rural people.

Unit III (08 Sessions)

Managing co-operatives, emergence, endurance and growth of co-operatives; Leadership issues in co-operatives, evolution of co-operative technologies; Co-operative principles; Issues in establishing agricultural co-operatives, democratic governance in co-operatives; co-operative principles and economic rationality; Anand pattern of co-operative-federal structure, causes of sickness, leadership issues and managing boards.

Unit IV (06 Sessions)

Economic Theory of co-operatives, agency theory, theory of contracts, transaction cost economics, game theory and their reciprocity, welfare economics and their co-operatives.

Unit V (08 Sessions)

Concept, measures and determinants of rural development; Critique of major rural development approach and strategies; growth vs equity oriented approach; area vs group based approach; top down vs participatory and people oriented approach to development planning; Contemporary growth and poverty alleviation programme; different interventions for rural social and infrastructure development; Role of Institutions in rural development-PRIs, NGOs etc; success and sustainability of rural development interventions, MNREGA

Suggested Reading

1. Jonathan Reuvid, Guide to Rural Business (Kogan Page)
2. Deu S. Mahendra and Basu K.S. - Economic and Social Development (Academic Foundation)
3. Brown Ben, Practical Accounting for Farm and Rural Business (Lavoisier) 2003.
4. Warren M - Financial Management for Farmers and Rural Managers (Blackwell Publishing)
5. Prag P A - Rural Diversification (EG Books)
6. Thorner Daniel and Morner Alice - Land and Labour in India (Asia Publishing House)

NMBA 034: PROJECT MANAGEMENT

Max. Hours: 40

Course Objective : The course is intended to develop the knowledge of the students in the management of projects, special emphasis will be provided on project formulation as also on various tools and techniques for project appraisal and control so that they are able to draft the project proposal in any area of management and evaluate the worth of projects.

Unit 1(6 Sessions)

Concept of project: Basic concepts, classification, characteristics of project, Project life cycle, Project management, Tools & Techniques of project management, project organization.

Unit II(08 Sessions)

Project identification: Identification, generation of ideas, SWOT analysis, Preliminary screening, project rating index.

Market & Demand Analysis: Collection of data, market survey, market planning, market environment, project risk analysis, demand forecasting techniques.

Unit III (08 Sessions)

Technical Analysis: selection of technology, material input and utilities, plant capacity, location & site, machinery and equipment, structures and civil work, environmental aspects, project charts and layouts.

Financial Estimation: Project cost, source of finance, cost of production.

Unit IV (08 Sessions)

Financial Analysis: Characteristics of financial statement, Working Capital, Project income statement, projected cash flow statement, projected balance sheet, projected profitability.

Investment Evaluation: Investment decision rule, techniques of evaluation, payback period, accounting rate of return, profitability index method, Net profitability index, Internal rate of return, discounted payback period.

Unit V (10 Sessions)

Social Cost Benefit Analysis: Concept of social cost benefit, significance of SCBA, Approach to SCBA, UNIDO approach to SCBA, Shadow pricing of resource, the little miracle approach,

Project Implementation: Schedule of project implementation, Project Planning, Project Control, Human aspects of project management, team building, high performance team.

SUGGESTED READINGS

1. Marwah-Project Management(Wiley Dreamtech)
2. Chaturvedi & Jauhari-Project Management(Himalaya Publishing)
3. Chandra Prasanna - Project : Preparation ,Appraisal, Budgeting and Implementation. (TMH, 5th Ed.)
4. Mishra - Project Management (Excel Books)
5. Goyal BB – Project Management : A Development Perspective (Deep & Deep)
6. Gopalan- Project Management Core Text Book (Wiley)

NMBA 041: STRATEGIC MANAGEMENT

Max. Hours: 40

COURSE OBJECTIVE:

The present course aims at familiarizing the participants with the concepts, tools and techniques of corporate strategic management so as to enable them to develop analytical and conceptual skills and the ability to look at the totality of situations. Class participation will be fundamental to the development of the skills of the students.

UNIT I (6 Sessions)

Introduction, Strategic Management, Business Policy, Corporate Strategy, Basic Concept of Strategic Management, Mission, Vision, Objectives, Impact of globalization, Basic Model of Strategic Management, Strategic Decision Making.

UNIT II (8 Sessions)

Impact of Internet and E-Commerce, Role of Strategic Management in Marketing, Finance, HR and Global Competitiveness.

Environmental Scanning, Industry Analysis, Competitive Intelligence ETOP Study, OCP, SAP Scanning,

UNIT III (10 Sessions)

Corporate Analysis, Resource based approach, Value-Chain Approach, Scanning Functional Resources, Strategic Budget and Audit.

SWOT Analysis, TOWS Matrix, Various Corporate Strategies: Growth/ Expansion, Diversification, Stability, Retrenchment & Combination Strategy.

UNIT IV (8 Sessions)

Process of Strategic Planning, Stages of corporate development, Corporate Restructuring, Mergers & Acquisitions, Strategic Alliances, Portfolio Analysis, Corporate Parenting, Functional Strategy, BCG Model, GE 9 Cell, Porters Model: 5 Force and Porters Diamond Model, Strategic Choice.

UNIT V (8 Sessions)

Strategy Implementation through structure, through Human Resource Management: through values and ethics. Mc Kinsey's 7S Model, Organization Life Cycle, Management and Control, Activity based Costing, Strategic Information System.

Case Study related to the Entire Syllabus.

Suggested Reading

1. Carpenter-Strategic Management(Pearson)
2. Kazmi A. - Business Policy and Strategic Management (Tata Mc Graw Hill, 2nd Ed.)
3. Kachru - Strategic Management: (Excel Books)
4. Cliff Bowman - Business Policy and Strategy (Prentice Hall of India)
5. Trehan- Strategic Management (Wiley)
6. Mc Carthy D.J., Minichiello Robert J., and Curran J.R. - Business Policty and Strategy (AITBS)
7. Lawrence R.Jauch., Glueck William F. - Business Policy and Strategic Management (Frank Brothers)
8. Pearce II John A. and Robinson J.R. and Richard B. - Strategic Management (AITBS)

NMBA042: INSURANCE & RISK MANAGEMENT

Max. Hours : 40

Course Objective

To make the budding finance professionals understand the fundamentals of Insurance and Risk Management in order to enhance their knowledge and decision-making skills required for this specialty sector.

UNIT - I (8 sessions)

Introduction and Scope of Insurance- Historical perspective, Conceptual Framework, Meaning, Nature and Scope of Insurance, Classification of Insurance Business viz., Life Insurance and General Insurance. Role of Insurance in Economic Development & Insurers' Obligation towards Rural and Social Sectors. Price of a financial transaction, Statistics and probability from single risk to portfolios. Pooling risks: mutuality & solidarity Introduction to reinsurance,

Principles of Life Insurance and Governance of Insurance Business.

UNIT - II (10 sessions)

Life insurance technique: the basics- Demographical bases, life insurance products:Single premiums, single recurrent and periodic premium insurance, products, Mathematical provisions, life insurance products: Endowment, Life annuity, unit and index linked, pension funds

Life insurance technique: applications- Life insurance with benefits linked to investment performance, the valuation of the life insurance business, Portfolio Evaluation tools Risks and Solvency, Pension Funds and Occupational Pension Schemes

Non life insurance technique: the basics- Actuarial Model for calculation of premium rates, risk classification Non-life technical provisions.

UNIT - III (6 sessions)

Financial Aspects of Insurance Management- Insurance Companies and functions, Mutual Funds, Housing Finance.

Important Life Insurance Products and General Insurance Products Determination of Premiums and Bonuses Various Distribution Channels

Unit - IV (8 sessions)

Risk Management: Risk management objectives and tools, risk management and value creation, the risk management process, enterprise-wide risk management, Risk management in industrial companies, RAPM - Risk Adjusted Performance Measures, value at Risk and Underwriting, Role of Actuaries- Product framing, Underwriting guidelines. Preparation of Insurance Documents

Policy Conditions

UNIT - V (8 sessions)

Settlement of Claims, Insurance Laws and Regulations with respect to following Acts.

Insurance Act 1938, Life Insurance Corporation Act 1956, IRDA Act 1999, Ombudsman Scheme, Income Tax Act, Wealth Tax Act 1957, Married Women's Property Act 1874. Code of Conduct in Advertisement, Financial Planning and Taxation, Bank Deposit Schemes, Unit Trust and Mutual Funds, Shares, Tax Benefits under Life Insurance Policies

Suggested Readings:

1. Neelam Gulati-Principles of Risk Management& Insurance (Excel Books)
2. Kakkar & Srivastava – Insurance and Risk Management (Universities Press)
3. Vaughan & Vaughan - Fundamentals of risk & Insurance (John Wiley & Sons, New York)
4. Srivastava D.C., Srivastava Shashank - Indian Insurance Industry Transition & Prospects (New Century Publications, Delhi)
5. Mishra M.N. - Insurance Principle & Practice (Sultan Chand & Company Ltd., New Delhi)

NMBA 043: HOSPITALITY & TOURISM MANAGEMENT

Max. Hours : 40

Course objective

This course acquaints the student with the scope and complexity of the hospitality and tourism industry by exploring the national and global relationships.

UNIT I (08 Sessions)

What is Tourism? Definitions and Concepts, Tourist destination, services and industry, General Tourism Trends. Types of Tourists, Visitor, Traveller, and Excursionist–Definition and differentiation. Inter–regional and intra–regional tourism, inbound and outbound tourism, domestic, international tourism. Forms of Tourism: religious, historical, social, adventure, health, business, conferences, conventions, incentives, sports and adventure, senior tourism, special interest tourism like culture or nature oriented, ethnic or 'roots' tourism and VFR.

New Trends of travel, E- Commerce and Online communication in Tourism

UNIT II (08 Sessions)

Definition of Tourism Product, Elements and characteristics of tourism products. Tourism product Life Cycle, Typology of tourism products.

Natural Resources:Wildlife Sanctuaries, National Parks and Natural Reserves in India

World Heritage Sites of India:Ajanta &Ellora Caves, TajMahal, Agra Fort, Sun Temple, Konark, Monuments at Khajuraho, Monuments at Hampi

Fairs and Festivals: Kumbha, Pushkar,Pongal/Makar-Sankranti, Baishakhi,Holi,Onam, Durga Puja, Diwali, KartikPurnima (DevDeepawali, Guru Parb), Rathyatra, Barawafat, Id-ul-Fitr, Easter, Christmas, Carnival (Goa), Ganga Mahotsava, TajMahotsava, KhajurahoMahotsava and Desert Festival. Dance & Music:Classical

UNIT III (08 Sessions)

Origin of Travel Agency. Definition and scope of Travel Agency. Definition of Tour Operator and Tour operation. Differences between Travel Agency and Tour Operator.

Travel Agency: Functions, Organization, Tour operator functions and organizations, client handling; Income sources.

Setting up of Travel Agency, Approval procedure for Travel Agent and Tour operator by DOT: IATA rules and regulations.

UNIT IV (08 Sessions)

Introduction to the Hospitality Industry - Origin, Nature and Importance, Hotel Organisational structure and its hierarchy of Very Large, Large and medium hotels and Hotel Chains of India,Classification of Hotels and Hotel Categories (Star Rating), Hotel Revenue Centres – Rooms Division, F& B Division,

UNIT V (08 Sessions)

Hotel Cost Centres- Marketing, Engineering, Accounting, Human Resources, Security.

Types of Hotel Rooms, Plans and Rates, Front Office and its coordination with other , Classification of Hotels – as per Location, Size, Target Markets, Levels of Service, Ownership & Affiliation, Other Lodging Establishments departments, Laws and rules pertaining to Hospitality Industry, Hospitality Organisation-FHRAI, HRACC, IH&RA, Customer Care - general etiquettes, telephone handling, effective communication skills

Suggested Readings:

1 Goeldner-Tourism Principles &Philosphy(Wiley Dreamtech)
2 Dixit, M and Sheela, C. Tourism Products (New Royal Book, 2001)
3 Hospitality and Tourism – Kadam R (UDH Publishers edition 2013)
4 Tourism Marketing-Devashis Das Gupta-(Pearson)
5 Misra & Sadaul- Basic of Tourism Management (Excel Books)
6 Walker –Introduction to hospitality Management 2e (Prentice hall)
7 Kotler-Marketing for Hospitality and Tourism (Prentice hall)

NMBA 044: BEHAVIOURAL FINANCE **Max. Hours : 40**

Course Objective

The purpose of this course is to introduce the student to the new field of behavioural finance. The theory is based on the notion that investors behave in a rational, predictable and an unbiased manner. While behavioural finance challenges this traditionally held notion. Reliant upon cognitive psychology decision theory, behavioural finance is the study of how investors' interpret and act on available, fallible information. This course will help the students to identify persistent or systematic behavioural factors that influence investment behavior

UNIT I (8 Sessions)

Behavioural Finance: Nature, Scope, Objectives and Significance & Application. History of Behavioural Finance, Psychology: Concept, Nature, Importance, The psychology of financial markets, The psychology of investor behaviour, Behavioural Finance Market Strategies, Prospect Theory, Loss aversion theory under Prospect Theory & mental accounting—investors Disposition effect .

UNIT II (8 Sessions)

Building block of Behavioural Finance, Cognitive Psychology and limits to arbitrage. Demand by arbitrageurs: Definition of arbitrageur; Long-short trades; Risk vs. Horizon; Transaction costs and short-selling costs; Fundamental risk; Noise-trader risk; Professional arbitrage; Destabilizing informed trading (positive feedback, predation) Expected utility as a basis for decision-making. The evolution of theories based on expected utility concept.

UNIT III (08 Sessions)

Elsberg's paradoxes, Rationality from an economics and evolutionary prospective. Different ways to define rationality: dependence on time horizon, individual or group rationality. Herbert Simon and bounded rationality. Demand by average investors: Definition of average investor; Belief biases; Limited attention and categorization; Non-traditional preferences – prospect theory and loss aversion; Bubbles and systematic investor sentiment.

UNIT IV (08 Sessions)

External factors and investor behaviour: Fear & Greed in Financial Market, emotions and financial markets: geomagnetic storm, Statistical methodology for capturing the effects of external influence onto stock market returns

UNIT V (08 Sessions)

Behavioral corporate finance: Empirical data on dividend presence or absence, ex-dividend day behavior. Timing of good and bad corporate news announcement. Systematic approach of using behavioural factors in corporate decision-making. Neurophysiology of risk-taking. Personality traits and risk attitudes in different domains.

Suggested Readings:

1. Finding Financial Wisdom in Unconventional Places (Columbia Business School Publishing)
2. Bisen,pandey-Learning Behavioural Finance(Excel Books)
3. A History of Financial Speculation: Edward Chancellor
4. Forbes- Behavioural Finance (Wiley India)
5. The Little Book of Behavioral Investing (Montier)
6. The Psychology of Persuasion (Collins Business Essentials)

NMBA HR 01: LEADERSHIP & PERSONALITY DEVELOPMENT

Max. Hours : 40

Objectives: This course focuses on helping students develop an ongoing, flexible portfolio of information about them and work in order to prepare them self for satisfying and productive lives in an ever-changing world. The course is aimed at equipping the students with necessary concepts and techniques to develop effective leadership skills to inform others induce them and enlist their activity and willing co-operation in the performance of their jobs

UNIT I (08 Sessions)

Personality : Meaning & Concept, Personality Patterns, Symbols of Self, Moulding the Personality Pattern, Persistence & Change. Personality & Personal Effectiveness: Psychometric Theories – Cattele and Big Five, Psychodynamic Theories - Carl Jung and MBTI, Transactional Analysis, Johari – Window, Personal Effectiveness.

UNIT II (06 Sessions)

Personality Determinants : An overview of Personality determinants. Evaluation of Personality: Sick Personalities and Healthy Personalities.

UNIT III (10 Sessions)

Training : Concept, Role, Need and Importance of Training, Types of Training, Understanding Process of Learning, Developing an Integrated Approach of Learning in Training Programme. Training Need Assessment

UNIT IV (8 Sessions)

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership- Leader, Followers and situation. Leadership Skills – Basic Leadership Skills, Building Technical Competency, Advanced Leadership Skills, Team Building for Work Teams, Building High Performance Teams.

UNIT V (08 Sessions)

Assessing Leadership & Measuring Its effects. Groups, Teams and Their Leadership. Groups – Nature, Group Size, Stages of Group Development, Group Roles, Group Norms, Group Cohesion. Teams – Effective Team Characteristics and Team Building, Ginnetts Team Effectiveness Leadership Model.

Suggested Readings :

1. Yukl G - Leadership in Organisations (Prentice hall, 7th Ed.)
2. Lall & Sharma – Personal Growth Trainning & Development (Excel Books)
3. Janakiraman- Trainning & Development (Biztantra)
4. Yukl G - Leadership in Organisations (Pearson, 6th Ed.)
5. Hurlock., Elizabeth B - Personality Development (Tata McGraw Hill, 1st Ed.)
6. Udai Pareek - Understanding Organizational Behaviour (Oxford, 2nd Ed.)
7. Sahu R..K. - Training for Development (Excel Books, 1st Ed.)

NMBA HR 02: INDUSTRIAL RELATIONS AND LABOUR ENACTMENTS

Max. Hours : 40

COURSE OBJECTIVE: The Course intends to educate and create awareness among the participants about various aspects of Industrial Relations and thus equip them to handle this delicate subject with maturity, objectivity and understandings. To gain knowledge of concepts, issues and legal framework of Industrial Relations.

UNIT I (6 Sessions)

Overview of Industrial Relations : Concept of Industrial Relations; Nature of Industrial Relations; Objectives of IR; Evolution of IR in India ; Role of State; Trade Union; Employers' Organisation; ILO in IR.

UNIT II (8 Sessions)

Trade Unionism : Trade Union : origin and growth, unions after independence, unions in the era of liberalization; concept, objectives, functions and role of Trade Unions in collective bargaining; problems of Trade Unions.

UNIT III (6 Sessions)

Labour problems : Discipline and misconduct; Grievance Handling Procedure; Labour turnover; Absenteeism; Workers' participation in management.

UNIT IV (8 Sessions)

Technological Change in IR-Employment issues, Management Strategy, Trade Union Response, Human Resource Management and IR- Management Approaches, Integrative Approaches to HRM; International Dimensions of IR.

UNIT V (12 Sessions)

Labour Legislations: Industrial Dispute Act, Factories Act, Payment of Wages Act, Workmen's Compensation Act. Important Provisions of Employees' State Insurance Act, Payment of Gratuity Act, Employees Provident Fund Act.

Suggested Readings :

1. Mamoria CB, Mamoria, Gankar - Dynamics of Industrial Relations (Himalayan Publications, 15th Ed.)
2. Singh B.D. - Industrial Relations & Labour Laws (Excel, 1st Ed.)
3. Kogent - Industrial Relations & Labour Laws (Wiley Dreamtech)
4. Srivastava SC - Industrial Relations and Labour Laws (Vikas, 2000, 4th Ed.)
5. Venkata Ratnam – Industrial Relations (Oxford, 2006, 2nd Ed.)

NMBA HR 03: NEGOTIATION & COUNSELLING

Max. Hours : 40

Objectives: *The objective of this course is to provide knowledge of concepts and issues of negotiation and counseling such that to equip the students with valuable skills, techniques and strategies in counseling.*

UNIT I (06 Sessions)

Negotiation: Nature, Characteristics, Strategy and Tactics of Distributive Bargaining, Strategy and Tactics of Integrative Negotiation; Strategy and Planning for Negotiation.

UNIT II (06 Sessions)

Negotiation Sub processes: Perception, Cognition and Emotion Communication: What is communicated during negotiation and how people communicate in Negotiation.

UNIT III (08 Sessions)

Best Practices in Negotiation – Fundamental Structure of negotiation and BATNA. Case I - Role Negotiation at Bokaro Steel Plant (Understanding Organizational Behaviour. By Udai Pareek, Oxford, Second Edition Page 410-415).

UNIT IV (10 Sessions)

International and Cross Cultural Negotiation: Context and Concept, Influence of Culture on Negotiation: Case II - The Dabhol Debacle (Negotiation Made Simple, SL Rao, Excel Books pp.30-35 and pp. 196-197).

UNIT V (10 Sessions)

Emergence & Growth of Counselling: Factors contributing to the emergence, Approaches to Counselling: Behaviouristic, Humanistic Approaches and Rogers Self Theory Counselling Process : Steps in Counselling Process. Modern Trends in Counselling – Trends, Role of a Counsellor and Model of Conselling.

Suggested Readings :

1. Lewicki, Saunders & Barry - Netgotiation (Tata Mc Graw Hill, 5th Ed.)
2. B.D.Singh - Negotiation Made Simple (Excel Books, 1st Ed.)
3. . Rao S N - Counseling and Guidance (Tata Mc Graw Hill, 2nd Ed.)
4. Singh Kavita - Counselling Skills for Managers (PHI, 1st Ed.)
5. Welfel, Patternson - The Counselling Process, A Multi theoretical Integrative Approach. (Thomson India, 6th Ed.)
6. Pareek Udai - Understanding Organisational Behaviour (Oxford)

NMBA MK01: CONSUMER BEHAVIOUR AND CUSTOMER LOYALTY

Minimum Hours: 40

Course Objective:

Objective of this course on Consumer Behavior and Customer Loyalty is to present a comprehensive coverage of the subject with examples from the Indian Scenario. This course also challenges students to understand the complexities of consumer needs and perceptions and translate them into effective Marketing Strategies. The course will be focusing on real life case-studies from Indian environment.

UNIT I (08 Sessions)

Overview of Consumer Behaviour

Understanding Consumer Behavior- Meaning and Concept of Consumer and Customer, Consumer Learning, Different Models in Consumer Behavior, Consumer Decision making process-Concept of Consumer Decision; Levels of Consumer Decision Making; Consumer Decision Making Model, Changing Indian Consumer Behavior-Drivers of Change; Changing Consumer Trends; Rural Consumer Behavior; New Consumption Patterns, Organisational Buying Behaviour

UNIT II (10 Sessions)

Factors Influencing Consumer Buying Decision

Influence of Culture on Consumer Behavior-Concept of Culture; The measurement of Culture; Indian Core Values; Cultural aspects of emerging markets, Values, Lifestyles, and Psychographics- Impact of Values, Lifestyles and Psychographics on buying behavior; Demographics, Lifestyles and Psychographics; Values and Value Systems, Group Influence on Consumption- Role of reference groups; Effect of reference groups on consumer decision making; Celebrity endorsements

UNIT III (8 Sessions)

Customer Loyalty Comprehension

Meaning and definition of customer loyalty, Significance of Customer Loyalty, Customer Loyalty Ladder, Loyalty Principles, Benefits of Customer Loyalty, Customer Loyalty and its relationship with customer satisfaction, Customer retention and Brand Loyalty, Factors affecting customer loyalty formation, Rai-Srivastava model of customer loyalty formation, Drivers of Customer Loyalty.

UNIT IV (8 Sessions)

Customer Loyalty Outcomes

Characteristic Features of Behavioral Loyalty, Attitudinal Loyalty and Cognitive Loyalty, Role of Customer Loyalty outcomes in business decisions, Significance of Customer Loyalty for Marketers, Relationship Influencers of Customer Loyalty including factors mediating customer loyalty relationship with other relationship influencers, Customer Affinity, Customer Engagement.

UNIT V (06 Sessions)

Customer Loyalty Measurement and Application

Measuring Customer Loyalty, Customer Loyalty measurement models and scales, Influence of Service Quality on Customer Loyalty, Customer Loyalty in Retail Industry, Customer Loyalty in Banking and Insurance Industry, Customer Loyalty Application in Aviation Industry

Suggested Readings

1. D. L. Loudon, J. Albert Della Bitta: Consumer Behavior; Concepts and Applications, Tata McGraw Hill Publishing Company Limited
2. L. G. Schiffman, L. L. Kanuk, & S. R. Kumar: Consumer Behavior, Pearson Education Inc.
3. Rai Alok K., Srivastava M., "The Character of Customer Loyalty", TATA MCGraw Hill
4. Kazmi & Batra- Consumer Behaviour (ExcelBooks)
5. Henry A.: Consumer Behavior and Marketing Action, Thomson Asia Pte Ltd.
6. M. Evans, A. Jamal, & G. Foxall : Consumer Behavior, John Wiley & Sons LTD.
7. M. Khan: Consumer Behavior, New Age International Publishers.

NMBA MK 02: INTEGRATED MARKETING COMMUNICATIONS Minimum Hours: 40

Course Objective:

To familiarize the students with the different elements of Integrated marketing communications, so that they can look at marketing communications with a holistic approach**.** The course is designed to enable the students to learn the basics of marketing communications.

UNIT I (6 Sessions)

Integrated Marketing Communication (IMC): Marketing Communication, Objectives of Marketing Communication, Factors contributing to IMC, Participants in IMC, IMC Promotion Mix, IMC Management & Planning Model, Challenges in IMC,

UNIT II (10 Sessions)

Advertising Management: Meaning, Nature and Scope of Advertising, Advertising – Classification of advertising, Types of advertising, advertising appropriation, advertising campaigns Process of Advertising, Customer and Competitor Analysis, STP Strategies for Advertising. Advertising Agencies – their role, functions, organisation, Remuneration, client agency relationship, account Planning; Hoarding Contractors; Printers, etc. Management of Advertising Agencies, Role of Advertising in Natural Development, Testing of Advertising Effectiveness, Preparation and Choice of Methods of Advertising Budget, Ethical and Social Issues in Advertising

UNIT III (08 Sessions):

Message Design-The Creative concept development; the creative processes of the different forms of IMC; AIDA model Considerations for creative idea Visualization. Creative planning, creative strategy development, Communications appeals and execution, Message strategy design considerations, Source of the message, Message integration, Advertorials and Infomercials, Evaluation of Creative Strategy/work. Campaign Planning: Message Creation, Copywriting. Role of Creativity in Copywriting

UNIT IV (06 Sessions)

Media Management - Media Types and their characteristics; Setting Media objectives; Considering key media concepts; Media planning; Media Strategy; Media buying; Cross media concept; and media research.

UNIT V (10 Sessions)

Emerging Concepts and Issues in Marketing Communications

Sponsorship: POP: Supportive Communication, Role of E-Commerce in Marketing Communication. Corporate Communication, Public Relations – Types of PR, Sales Promotion – Different types of Sales Promotion, relationship between Sales promotion and advertising, Publicity – Types of Publicity, relationship between advertising and publicity, Personal Selling, Direct marketing and direct response methods, Event Management

Suggested Readings:

1. Siraj M Joseph & Rahtz Don R : Integrated Marketing Communication – A Strategic Approach, Cengage Learning
2. Kenneth Clow & Donald Baack : Integrated Advertising, Promotion, and Marketing Communications, Pearson Education, Limited
3. Borden & Marshall : Advertising Management; MV Taraporevala Sons' Co Pvt. Ltd, Richard D Irwin Inc. Homewood, Illinois.
4. Chunawala & Sethia : Foundations of Advertising Theory & Practice; Himalaya Publishing House
5. Copley Paul : Marketing Communications Management Concepts & theories, Cases and Practices; Butterworth- Heinemann Publication
6. Duncon : Integrated Marketing Communications, Tata McGraw Hills

NMBA MK03 RETAILING AND DISTRIBUTION MANAGEMENT Minimum Hours: 40

Course Objective:

This program helps management students to understand the fundamentals of Distribution management and familiarizing the participants with the global dynamism of retail practices and provides a specialize platform for developing cutting edge skills in retails.Class participation will be fundamental to the development of these skills.

UNIT I (08 Sessions)

Distribution Management: An Overview

Meaning, concept and elements of Distribution; Growing importance of distribution for strategic advantage; Value chain and marketing intermediaries; Various marketing intermediaries and their roles in value addition; Conventional distribution systems for various product categories; Multiple Channel Systems; Designing channel structure and strategy

UNIT II (08 Sessions)

IT enabled Distribution Systems & Channel Relationships

IT enabled Distribution Systems; Disintermediation vs Reintermediation; Cybermediary (e-commerce), Partial disintermediation, Infomediary; Intermediary empowerment; Framework for adoption of IT enabled distribution systems; Nature and characteristics of Partnering Channel Relationships; Stages, Reasons and Factors of developing Partnering Channel Relationships; Channel Conflicts and Resolution Strategies; Partnering Channel Relationships and IT

UNITIII (10 Sessions)

Logistics Management

Concept, Types, and Functions of Inventory; Inventory Management Tools and Techniques; Nature, Concept, Types, Functions and Strategy of Warehousing; Value of Information in Logistics and Bullwhip Effect; Logistics Information System and Order Processing, Concept, Evolution and Objectives of Logistics Management; Components and Functions of Logistics Management; Distribution related Issues and Challenges for Logistics Management; Gaining competitive advantage through Logistics Management;

UNIT IV (06 Sessions)

Retail Management: An Overview

Concept and Evolution; Functions and Role of Retailing in Distribution; Social and Economic significance of Retailing; Formats of Retailing; Organized Retailing; Technology in Retailing; Present Indian Retailing Scenario

UNIT V (8 Sessions)

Retail Management Decisions

Organizational buying formats and processes; Merchandise Planning systems; Category Management; Logistics issues in Retailing; Inventory Management and Replenishment Systems; Value of Information visibility, Functions, Costs, and Modes of Transportation, Selection of Transport Mode; Transportation Network and Decision

Suggested Readings:

1. Agrawal D. K., Distribution & Logistics Management: A Strategic Marketing Approach, Macmillan Publishers India Ltd. New Delhi,
2. Berman- Retail Management Strategic approach-11e (Prentice hall)
3. Cox-Retailing An introduction 5e (Prentice hall)
4. Alan Rushton, Phil Croucher & Peter Baker, The Handbook of Logistics & Distribution Management, Kogan Page Ltd. London,
5. Anne T. Coughlan, Erin Anderson, Louis W. Stern & Adel I. El-Ansary, Marketing Channels, Pearson Education, Delhi,
6. P. K. Sinha & D. P. Uniyal, : Managing Retailing, Oxford University Press.
7. Michael Levy, Barton A Weitz and Ajay Pandit, Retailing Management, McGraw Hill, New Delhi,
8. Varley R and Rafiq M : Principles of Retail Management, Palgrave Macmillan, Basingstoke

NMBA FM 01: SECURITY ANALYSIS AND INVESTMENT MANAGEMENT

Max. Hours: 40

COURSE OBJECTIVE: The objective of this course is to expose the students to the concepts, tools and techniques applicable in the field of security analysis and portfolio management.

Unit I (08 Sessions)

Overview of Capital Market: Market of securities, Stock Exchange and New Issue Markets - their nature, structure, functioning and limitations; Trading of securities: equity and debentures/ bonds. Regulatory Mechanism: SEBI and its guidelines; Investor Protection, Saving, investment, speculation. Type of investors, Aim & Approaches of security analysis.

Unit II (08 Sessions)

Risk & Return: Concept of Risk, Component & Measurement of risk, covariance, correlation coefficient, measurement of systematic risk.

Fundamental Analysis: Economic, Industry, Company Analysis, Technical Analysis: DOW Theory, Support and Resistance level, Type of charts & its interpretations, Trend line, Gap Wave Theory, Relative strength analysis , Technical Versus Fundamental analysis.

Unit III (08 Sessions)

Nature of Stock Markets: EMH (Efficient Market Hypothesis) and its implications for investment decision. Valuation of Equity: Nature of equity instruments, Equity Valuation Models. Approaches to Equity Valuation: Valuation of Debentures/Bonds : nature of bonds, valuation, Bond theorem, Term structure of interest rates, Duration. Valuation of Derivatives (Options and futures): concept, trading, valuation.

Unit IV (08 Sessions)

Portfolio Analysis and Selection: Portfolio concept, Portfolio risk and return, Beta as a measure of risk, calculation of beta, Selection of Portfolio: Markowitz's Theory, Single Index Model, Capital market theorem, CAPM (Capital Asset Pricing Model) and Arbitrage Pricing Theory.

Unit V (08Sessions)

Portfolio Management and Performance Evaluation: Performance evaluation of existing portfolio, Sharpe, Treynor and Jensen measures; Finding alternatives and revision of portfolio; Portfolio Management and Mutual Fund Industry

SUGGESTED READINGS:

1) Ranganatham - Security Analysis and Portfolio Management (Pearson Education, 2st Ed.)
2) Chandra P - Investment Analysis and Portfolio Management *(*Tata Mc Graw Hill, 2008)
3) Bhatt - Security Analysis and Portfolio Management (Excel Books)
4) Bhatt- Security Analysis and Portfolio Management (Wiley Dreamtech)
5)Pandian P - Security Analysis and Portfolio Management (Vikas, 1st Ed.)
6) Bodie, Kane, Marcus & Mohanti - Investment and Indian Perspective (TMH, 6th Ed.).

NMBA FM 02 : MANAGEMENT OF FINANCIAL INSTITUTIONS AND SERVICES

Max. Hours: 40

COURSE OBJECTIVE:

The present course aims at familiarizing the participants with objectives, strategies, policies and practices of major financial institutions in India and various financial services.

Unit I : (08 Sessions)
Financial System and Markets: Constituents and functioning; RBI – Role and functions. Regulation of money and credit, Monetary and fiscal policies, Techniques of regulation and rates; Overview of Foreign Exchange Market, Financial Sector Reforms in India, Overview of Financial Services: nature, scope and importance etc.

Unit II : (08 Sessions)
Banking Industry in India, constituents, banking sector reforms, determination of commercial interest rates: fixed and floating, Management of capital funds- capital adequacy norms, Liquidity Management, Asset Liability Management - Gap analysis, Management of Non- performing assets, Strategies for making commercial banks viable.

Unit III : (10 Sessions)
Securitisation : concept, nature, scope and their implications. Securitization of Auto loans and housing loans, Securitisation in India. DFIs in India - IDBI, ICICI, IFCI, NABARD, RRBs, State Level Institutions ; NBFCs - Their status, types, working and strategies for commercial viability ; Insurance organisations **-** Their status, types, working and strategies for commercial viability.

Unit IV : (10 Sessions)
Leasing and Hire Purchase: Industry. Size and scope. Parties involved, Evaluation of Lease transaction, Types of lease and their implications, Hire purchase and lease - differences and implications for the business. Other financial services: Factoring, Forfeiting, Discounting and Re Discounting Of Bills, Consumer Credit and Plastic Money – concept, working and uses of each.

Unit V(06 Sessions)
Concept,Types,Significance of Mutual Funds, NAV, Evolution & Growth of Mutual Funds, Role of Registrar, Underwriter according to SEBI guidelines.

SUGGESTED READINGS:

1) Fabozzi - Foundations of Financial Markets and Institutions (Pretice hall, 3rd Ed.)
2)Parameswaran- Fundamentals of Financial Instruments (Wiley India)
3) Khan M Y - Financial Services (Tata Mc Graw Hill, 1998)
4) Machiraju H R - Indian Financial System (Vikas, 2004)
5) Bhole L M - Financial Institutions and Markets (Tata McGraw-Hill, 3rd edition, 2003)
6) Srivastava ,R.M & Nigam Divya - Management of Financial Institutions (Himalaya, 2003)
7) Gurusamy R - Financial Services & Markets (Thomson, 1st Ed.)

NMBA FM 03: TAX PLANNING AND MANAGEMENT

Max. Hours : 40

COURSE OBJECTIVE:

The present course aims at familiarizing the participants with the principles, problems and structure of different types of business taxes in Indian and relevance of these taxes in business decisions. Besides, a broad understanding or role of taxation in economic and industrial development of an economy will also be given.

Unit I (08 Sessions)
Nature and Scope of Tax Planning: Nature, Objectives of Tax Management, Tax Planning, Tax Avoidance & Tax Evasion, Assessment Year, Previous Year, Assessee – types, Residential status, Non-resident Indians.
Unit II (08 Sessions)
Tax on Individual Income – Computation of tax under the heads of Salaries, Income from House Property, Profits & Gains of Business, Capital Gains & Income from Other Sources. Tax deductible at source
Unit III (10 Sessions)
Corporate Income Tax: Tax concessions and incentives for corporate decisions. Tax planning for depreciation; Treatment of losses & unabsorbed items; Carry forward and set off losses. Tax and business reorganizations: merger and amalgamation, Tax planning regarding Employees Remuneration, Tax appeals, Revision & Review.
Unit IV (08 Sessions)
Wealth tax on closely held companies; Valuation of assets; Filing of returns; Assessment; Appeals; Review; Revision and Rectification.
Unit V (6 Sessions)
Central Excise Act 1994 and Excise planning; Customs Act and Customs Duties Planning

SUGGESTED READINGS:
1) Bhatia H L - Public Finance (Vikas)
2) Lakhotia R N - How to Save Wealth Tax (Vision Book 2001, 9th Ed.)
3) Prasad Bhagwati - Income Tax Law & Practice (Vishwa Prakashan)
4) Santaram R - Tax Planning by Reports (Taxmann, 1978).
5) Singhania V K - Direct Taxes, Law & Practice (Taxmann, 40th Ed.)
6) Datey V.S. - Indirect Taxes – Law & Practice (Taxmann, 20th Ed.)

NMBA 0IT 1: DATABASE MANAGEMENT SYSTEM

Max. Hours : 40

Course Objective

The course has been designed to introduce the students with the applications of systems designed to manage the data resources of organizations. It provides the students an opportunity to study the hands-on implementation of a database in corporate environment.

Unit I (8 Sessions)
Introduction to Database; Organisation of Database; Components of Database Management Systems; Data Models; Entity-Relationship Model; Network Data Model; Hierarchy Data Model; Relational Data Model; Semantic Data Model; Advantages of DBMS.
Unit II (6 Sessions)
Relational Database Design : Integrity Constraints; Functional Dependencies; Normalisation; Physical Database Design; Decomposition of Relation Schemes;
Unit III (6 Sessions)
Introduction to data mining & Data Warehousing; Knowledge Extraction through Data Mining.
Unit IV (12 Sessions)
Structured Query Language, Oracle- Creating Tables; Applying column constraints; Inserting Rows; Views, Snapshots, Indexes & Sequences. PL/SQL structure, Cursor, Triggers, Procedures, Functions & Package.
Unit V (8 Sessions)
Database Utilities; Security, Object/Basic Database Administration/ Remote Data Access.

SUGGESTED READINGS:

1. Chakrabarti- Advance Database Management System (Wiley Dreamtech)
2. Beynon -Davies P- Database Systems (Palgrave, 2003)
3. KarthikeyanUnderstanding Database Management System (Acme Learning)
4. 4)Hoffer - Modern Database Management (Pearson Education, 6th edition)
5. Alexis and Leon - Database Management System (Vikas, 2003.)
6. Majumdar and Bhattacharya - Database Management System (Tata Mc Graw Hill, 1996).
7. Navathe E - Fundamentals of Database Systems (Pearson Education, 3rd Ed.)

NMBA IT 02: SYSTEM ANALYSIS & DESIGN AND SOFTWARE ENGINEERING

Max. Hours : 40

Course Objective

This course is for the students of MBA program, who are specializing in Information Technology. It aims at acquainting these students with tools techniques of planning, analyzing, designing, implementing and maintaining Information system.

UNIT-I (08 Session)

Systems Concept; Characteristics of a System; Elements of System; Types of Systems; Decision Support System; System Development Life Cycle, Investigation, Analysis, Design, Implementation, Post Implementation Review and Maintenance.

UNIT-II (06 Session)

Systems Planning and Investigation: Basis for Planning in Systems Analysis - Dimensions of Planning, Initial Investigation, Needs Identification,

UNIT-III (06 Session)

Determining the User's Information Requirements, Feasibility Study, Feasibility Considerations, Steps in Feasibility Analysis - Feasibility Report.

UNIT-IV (10 Session)

Tools of Structured Analysis : Data Flow Diagram (DFD), Entity Relationship Diagrams, Data Dictionary, Process Modeling : Structured English, Decision Tree & Decision Table, Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

UNIT-V (10 Session)

Basics of Information Security, Types of Attacks, Viruses, Virus Control, Hackers, Overview of Risks associated with Internet, Intrusion Detection Risk Management**,** Disaster Recovery Plan, Cryptography and authentication, Managing Risk, Information Security Policy, Creating a secure environment, Internet Security Standards

Suggested Readings:

1. Shah-Software Engineering & SAD(Wiley Dreamtech)
2. Kenneth E Kendall and Julie E Kendall – SAD (PHI Publication, 7 Ed.)
3. Grienstein and Feinman- E-commerce –Security, Risk Management and Control (TMH, 2nd Ed.)
4. Ankit Fadia -Encryption-Protecting your Data (Vikas Publication, 1st Ed.)
5. Singh B –Network Security (PHI Publication, 1st Ed.)

NMBA IT 03: DATA COMMUNICATION & NETWORK

Max. Hours : 40

Course Objectives

This course provides an in-depth discussion of computer networks. It includes a detailed discussion of the different Network Models..

Unit I (08 Sessions)

Fundamentals of Communication System; Communication Links, Communication System Formats; Character Codes, Digital Data Rates; Asynchronous and Synchronous Data. Types of signals: AM; FM; PM; PCM; PDM; TDMA; FDMA; SDMA; CDMA; ASK; FSK; PSK Features: Error detection and correction codes; Hamming codes.

Unit II (08 Sessions)

LAN topologies: Workstation; Server; Cables; Types of Ethernet; Broadband and base-band; Optical Fibers; Network Interface Card.

Unit III (08 Sessions)

Networks and accessories: LAN, MAN, WAN; Hub; Bridges; Switches; Routers; Gateways Cell Relay; Frame Relay; ISDN; B-ISDN

Unit IV (08 Sessions)

OSI Model; Broadcasting; Multicasting; Point-to-point communication; IP Addressing, Concepts of Port; Socket; ATM; Tunneling; Virtual Private Network. *Network Operating systems:* Unix; Linux; Windows.

Unit V (08 Sessions)

Mobile Communication: Applications of Mobile Communication; Wireless Communication: Bandwidth, Transmission Impairment, Interference, Terrestrial Microwave, Broadcast Radio, Infrared & Light Waves, Mobile Internet & WML: Mobile IP, Wireless TCP& UDP, WAP, WML

SUGGESTED READINGS:

1. 2) Comer - Computer Networks and Internets (Pearson Education, 4th Ed.)
2. 3) Stallings W - Data Computer Communication (Pearson Education, 2003, 7th Ed.)
3. 4) Tanenbaum - Computer Networks (Prentice-Hall, 2004, 4th Ed.)
4. 5) Black - Computer Networks (Prentice-Hall, 1999, 2nd Ed.)

NMBA IB01: International Marketing Management **Max. Hours : 40**

COURSE OBJECTIVES: This paper deals with a broad conceptual focus on the marketing management problems, techniques and strategies necessary to incorporate the marketing concept into the framework of the world market place. The present course explores those aspects of marketing which are unique to international business

Unit I (08 Sessions)
Introduction, Importance and Challenges – Nature, Importance and scope of International Marketing, Domestic marketing vs. International marketing, International marketing management process – an overview, influence of physical, economic, socio-cultural, political and legal environments on International marketing information, scanning and monitoring global marketing environment; international marketing information system.

Unit II (08 Sessions)
International market segmentation, positioning, Analysis of world market, market analysis, international marketing research, screening and selection of markets, International market entry– Export, Licensing , Franchise, Joint Venture, Multinational operations, contract manufacturing

Unit III (08 Sessions)
International Product Policies – Major product decisions – product features and quality, product design, labeling, packaging, branding and product support services; strategies in multinational product planning, international product life cycle, New product development, International Trade

Unit IV (08 Sessions)
International Pricing Decisions – international Price determination, price escalation, international pricing process and policies, delivery terms and currency for export price quotations, international transfer pricing, methods of determining transfer pricing, Differential Pricing

Unit V (08 Sessions)
International marketing communication – communication with foreign buyers, planning and preparing, international promotion programme, Media structure, planning media strategy, corporate advertising.

SUGGESTED READINGS

1) Nargundkar- InternationalMarketing (Excel Books)
2) Czinkota - International Marketing (Thompson, 8th Ed.)
3) Cateora Graham - International Marketing (TMH, 10th Ed.)
4) Siddiqui- InternationalMarketing (Wiley Dreamtech)
5) Cherunilam F - International Trade and Export Management (Himalaya, 2007)
6) Varshney R.L, Bhattacharya B - International Marketing Management (Sultan Chand & Sons, 9th Ed.)
7) Jain S. – International Marketing (Thomson)

NMBA IB02: International Logistics and Documentation **Max. Hours: 40**

COURSE OBJECTIVES: This paper deals with a broad conceptual focus on the problems - related documentation in export and import and scenario of logistics in world place.

Unit I (06 Sessions)
International Distribution system and Logistics – International marketing channel decision, importance and scope of channel decisions, channels between nations, international physical distribution decisions, nature of physical distribution

Unit II (10 Sessions)
Transportation – Importance of effective transportation system, service choices and their characteristics, cost characteristics and role fixation, In-company management vs. outsourcing, shipping structure – Sea borne trade, international shipping characteristics, important international sea routes, liner & tramp operations, liner freighting, CFC and ICD, Indian shipping – growth, policy and problems, major Indian ports, International Air Transport, freight rates, India's exports and imports by air – problems and prospects, Air cargo, I.A.T.A.

Unit III (08 Sessions)
Documentation - Naming the enterprise, forms of ownership, opening a bank account, Need for documentation, Process of obtaining Export and Import License:- general registrations, registrations with RBI, registration with Licensing authorities, registration with appropriate EPC/Commodity Board's. Main commercial documents: statutory documents for exporting country, statutory documents for importing country, and documents for claiming export benefits.

Unit IV (08 Sessions)
International Trade Terms – International Trade Terms – trade contract and trade terms, credit risk management and payment terms,, LC & parties involved, types of LC, UCPDC – major clauses, consignment sale, transit risk management – contract of cargo insurance parties, Insurance policy and certificate, cargo loss clauses – procedure and documentation

Unit V (08 Sessions)
Clearance – excise duty – definition, types of duties, legal framework – central excise act and rules, tariffs, customs act 1962, customs tariffs act 1975, foreign trade act 1992, physical examination of goods, EDI and custom operations

SUGGESTED READING:

1. Johnson J, Wood D- Contemporary Logistics.
2. Reji Ismail- Logistic Management (ExcelBooks)
3. Dornier- Global Operation & Logistic Management (John Wiley)

4. Khanna K K - Physical Distribution Management : Logistical Approach (Himalaya, 2007)

NMBA IB03: International Financial Management **Max. Hours: 40**

COURSE OBJECTIVE: The main objective of this course is to familiarize the students with the international financial environment and the special decision variables underlying the discharge of finance function in a multinational corporation

Unit I (06 Sessions)

Global Financial Environment: Objective of financial management in a multinational corporation, functions of international financial management. Special decision variables in international financial management. International monetary system, Fischer Effect, International fisher effect.

Unit II (10 Sessions)

Management of exposure & risk: Concept of exposure and risk. Types of exposure – transaction, transnational and economic exposure. Measurement of transaction exposure. Managing transaction exposure. Hedging Strategies.

International Portfolio Investment: Economic determinants. The national FDI policy framework. Benefits of inter-national equity and bond investing. International capital asset pricing model (ICAPM)

Unit III (08 Sessions)

International Capital Budgeting: The basic framework for analysis. Issues and strategic considerations in international capital budgeting. The adjusted present value approach (APV). Financial risk and cost of capital. Exchange risk and cost of capital. Political risk and cost of capital. Impact of hedging on cost of capital. Tax consideration – Branch vs. subsidiary, withholding tax. Foreign sales corporations, 80-20 subsidiaries and tax havens.

Unit IV (08 Sessions)

International working capital management:

i) International cash management: The cash positioning decision. Advantages and disadvantages of centralized cash management. Multilateral netting. Intra corporate transfer of funds. Transfer pricing, problems of international cash management.

ii) International Receivables management: Domestic v/s International receivables management. Letter of credit. International factoring & Accounts receivables.

iii) International inventory management: Advance inventory purchases. Stockpiling.

Unit V (08 Sessions)

International Financing Decisions:

i) Euro-money and Eurobond Markets. Size of the Euro currency market. Growth of Euro Dollar market. Instruments and rate of Euro Currency Markets. Creation of Euro deposits. Syndicated Eurocurrency loan Market. International Bond Markets, Multi-currency bonds and their types. Rationale for multi currency bonds.

ii) International Equity markets: Foreign equity market and their comparative performance. Recent developments and innovations in international capital markets. Recent developments in the Euro bond market.

Suggested Reading

1. Folks William R. Jr. & Raj Agrawal : International Dimensions of Financial Management
2. P.G. Apte :Global financial Management
3. Dennis J.D. Connor & Albert T Bussco : International Dimensions of Financial Management
4. Zenoff David B. & Zwick Dack : International Financial Management
5. Advani V.A. :International Finance: Theory and Practice
6. Seth Jagdish & Eshghi A: Global Financial Perspectives

NMBA RD 01: RURAL MARKETING

Max. Hours : 40

Course Objective

This has resulted in the expansion of rural demand of agricultural inputs, capital goods, transportation goods as well as consumer and consumer durable goods in villages. On the output side, the enlarged rural Production base has led to value addition, marketing networking and thrust on export trade. This paper aims at equipping the students to enable them to serve in the inflow and outflow marketing areas.

Unit I (08 Sessions)
Rural Marketing – Definition, Objectives, functions, Accelerated growth and importance of Rural Market. Factors accelerating growth. Classification of inflow marketing and out Flow marketing in rural Sector. Principles of sequentation of rural Markets.

Unit II (06 Sessions)
Modern and traditional system of Rural Marketing; Historical perspective of Haats, Bazaars and Melas. Their role as the hubs of rural economy. Laws regulating the conduct of business there in and also facilitating their modernization and expansion, Spatial issues and Management practices.

Unit III (06 Sessions)
Principles, procedures and processes of Rural Marketing Management and applications of systems approach. Rural Marketing strategy and implementation of the principles of Marketing Mix.

Unit IV (08 Sessions)
Rural Market demands - (I) Consumer goods, (ii) Consumer durables (iii) Agricultural Inputs, (iv) Capital goods, and (v) Transportation good of Distribution strategies and Channel Management.

Unit V (12 Sessions)
Regulated Market system and the State Legislation. Grading Standardization and legal metrology – Provisions of the relevant laws. Rural Market Intelligence, and Marketing Information System. Market Research, Survey Techniques, Report writing. State Market Intervention Operations, State Procurement, Minimum Support Price, Statutory Minimum Price, State Advised Price and price Management by the Union and State Governments.Logistics Management in Rural Marketing. Corporate strategies and State facilitation Programmes.

Suggested Readings

1 Pradeep Kashyap Rural Marketing-2 edition Pearson education
2. Jha, S.M. & Singh, L.P.: Marketing Management in Indian Perspective, Himalaya, Bombay
3.Velayudhan – Rural Marketing (Sage)
4. Mathur- Rural Marketing (Excel Books)
5. Philip Kotler: Marketing Management.
6. Barkar, J.W.: Agricultural Marketing, Oxford University Press, New York.
7.Chopra- Marketing Management (Wiley Dreamtech)

NMBA RD 02: Micro Finance, Small Group Management, and Cooperatives

Max. Hours: 40

Course Objective:

Self Help Group and other micro-level innovative credit systems contributed significantly in empowering underprivileged in India and abroad in recent times. Paper has two purposes—(a) to acquaint students with the various institutional arrangements as well as recent contribution of various innovative credit systems at the micro-level for financing rural development sector; (b) management of small groups involved in micro-finance for social and economic empowerment of their group members in particular and the society in general.

Unit I (08 Sessions)

Financial institutions for rural development-Basic understanding of rural and development credit. Institutional structure for rural financing in India: policy and schemes of NABARD, recent financing scheme of the Government.

Unit II (08 Sessions)
Development of cooperative banks in India with special reference to PACS, CCBs, LDBs. Rural financing through commercial banks-Policies and objectives before and after nationalisation of banks, Branch expansion policy and programmes.

Unit III (08 Sessions)
Emergence of RRBspolicy, objectives, functions, progress and achievements. Micro finance at small group level: concept, emergence, objectives and thrust areas. Case studies of recent success stories.

Unit IV (08 Sessions)
Management of small groups, cluster and federation from credit and trade perspectives. Role of facilitating agencies. Linkages between small group and Banks.

Unit V (08 Sessions)
Convergence of with development programmes and implementing departments of government. Withdrawal strategy for facilitating organizations.

Suggested Readings

1. V S Somnath- Microfinance (ExcelBooks)
2. Panda- Understanding Microfinance (Wiley India)
3. Craig Churchill & Cheryl Frankiewicz-Making Microfinance Work
4. Marguerite S. Robinson- The Microfinance Revolution (Kindle Edition)

NMBA RD 03: RURAL ECONOMICS

Max. Hours: 40

Course Objective

Familiarization with basic tools of economic analysis – Understanding the dynamics of rural sector – Adoption of suitable economic policies for efficient management of rural sector.

UNIT I (8 Sessions)

Agriculture and economic development: Nature and scope of rural economics, Role of agriculture in economic development, interdependence between agriculture and industry, Livestock economics- Livestock resources and their productivity, White revolution, Development of agro based industries.

UNIT II (8 Sessions)
Use of land, water and energy; Rural transport, Communication, banking, rural social infrastructure-education and health and information dissemination.
Agricultural Production- Resources used and efficiency, Production function analysis in agriculture.

UNIT III (8 Sessions)
Size of farm and laws of returns- Theoretical and empirical findings, Farm budgeting and cost concepts, resource use efficiency in traditional agriculture, Technical change, Labour absorption and gender issues in agricultural services,

UNIT IV (8 Sessions)
Rural labour supply, Interlocking of factor market, Mobility of labour and segmentation in labour markets, marginalization of rural labour, Nature, Extent and trends of rural unemployment, Agricultural wages in India, Male-Female wage differences, non-agricultural rural unemployment- Trends and determinants.

UNIT V (8 Sessions)
Role of capital and rural credit, Organized and unorganized capital market, Rural savings and capital formation, Characteristics and sources of rural credits- institutional and non-institutional, Reorganization of rural credit- cooperatives, commercial banks, Regional rural banks, role of NABARD.

Suggested Readings

1. Bhaduri A- The Economic Structure of Backward Agriculture (Macmillian, Delhi)
2. Bilgram S.A.R- Agricultural Economics (Himalyan Publishing House, New Delhi)
3. Dantwala M.L et. Al.- Indian Agricultural Development Since Independence (Oxford & amp: IBH)
4. Govornment Of India- Report of the National Commission on Agriculture
5. Govornment Of India- Economic Survey (Annual)
6. Gulati A & T Kelly- Trade Liberalization & Indian Agriculture (Oxford University Press)
7. Joshi P.C- Land Reforms in India: Trends & Prospects (Allied Publishers)

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

[Effective from Session 2013-14]

(1st Year)

[Common to all B.Tech. Branch except Agricultural Engineering]

(Effective from the session 2013-14)

Semester-I

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assesment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NAS 103	Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2	NEC-101/ NAS-104	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS102/ NME102	Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-101/ NCS 101	Basic Electrical Engg./Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-101	Engg. Physics-I	2	1	0	15	10	25	50	75	3
6	NME-101/ NAS-105	Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-152/ NME-152	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-151/ NCS-151	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NEW-151/ NCE-151	Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-151/ NAS-154	Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-101	GP						50		50	
		TOTAL	16	6	9					1000	26

L- Lecture

T -Tutorial

P-Practical

CT-Cumulative Test

TA-Teacher's Assessment

ESE-End Semester Examination

Semester-II

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assesment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-203	Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2	NEC-201/ NAS-204	Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3	NAS-202/ NME-202	Engg. Chemistry/ Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE-201/ NCS-201	Basic Electrical Engg./ Computer System and Programming in C	3	1	0	30	20	50	100	150	4
5	NAS-201	Engg. Physics-II	2	1	0	15	10	25	50	75	3
6	NME-201 / NAS-205	Basic Manufacturing Processes / Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NAS-252/ NME-252	Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE-251/ NCS-251	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9	NWS-251/ NCE-251	Workshop Practice / Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10	NAS-251/ NAS-254	Engg. Physics Lab / Professional Communication Lab	0	0	2	10	10	20	30	50	1
11	GP-201	GP						50		50	
		TOTAL	16	6	9					1000	26

Engineering Mathematics - I
(NAS-103)

L	T	P
3	1	0

Unit - 1: Differential Calculus - I

Leibnitz's theorem, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorems, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Linear Algebra

Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution,. Characteristic equation, Eigen values and eigen vectors, Cayley-Hamilton Theorem,A brief introduction to Vector Spaces,Subspaces. Rank & Nullity. Linear transformations.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Volumes and Surface areas – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and applications.

Unit - 5: Vector Calculus

Point function, Gradient,Divergence and Curl and their physical interpretations, Vector identities, Directional derivatives. Line,Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proofs),

Text Books:

1. **E. Kreyszig :Advanced Engineering Mathematics-Volume-I,JohnWiley & Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.**

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

NEC-101/NEC-201: ELECTRONICS ENGINEERING

Chapters/ Books **L T P 3 1 0**

Unit -1	**1st Book**	**10 Lecture**
Semiconductor Diode Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) **Diode Application** Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits **Special Purpose two terminal Devices** Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	**Chapter 1/1** **Chapter 2/1** **Chapter 16/1**	**2** **6** **2**
Unit II	**1st Book**	**12 Lecture**
Bipolar Junction Transistor Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration **DC Biasing BJTs** Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE,CB,CC amplifiers and analysis of single stage CE amplifier **Field Effect Transistor** Construction and Characteristic of JFETs. Transfer Characteristic. CS,CD,CG amplifier and analysis of CS amplifier MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	**Chapter 3/1** **Chapter 4/1** **Chapter 6/1**	**2** **6** **4**
Unit III	**1st Book**	**6 Lecture**
Operational Amplifiers Introduction, Differential Amplifier Circuits, Op-Amp Basic, Practical Op-Amp Circuits (Inverting Amplifier, Noninverting Amplifier, Unit Follower, Summing Amplifier, Integrator, Differentiator). Differential and Common-Mode Operation	**Chapter 10** **10.1,10.4,** **10.5, 10.9** **1st Book**	**6**
Unit IV	**2nd Book**	**4 Lecture**
Digital Voltmeter : Introduction, RAMP Techniques **Digital Multimeters**: **Oscilloscope**: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage , current phase and frequency using CRO	**5.1, 5.2** **2rd Book** **6.2** **2nd Book** **7.1,7.2,7.3,** **7.4,7.5,7.20** **2nd Books**	**4**
Unit V	**3rd Book**	**8 Lecture**
Fundamentals of Communication Engineering : Elements of a Communication System, Need of modulation, electromagnetic spectrum and typical applications, terminologies in communication systems, Basics of signal representation and analysis, Fundamentals of amplitude and angle modulation, modulation and demodulation techniques.	**Chapter 1, 2** **3rd Book**	**8**

Text Books

1. Robert L. Boylestad &Louis Nashelsky "**Electronic Devices and Circuit Theory**" , Tenth Edition, Pearson Education, 2013
2. H S Kalsi, "**Electronics Instrumentation**," Third Edition, TMH Publication 2012

3. George Kennedy, "**Electronic Communication System**", Fifth Edition , TMH Publication, 2012

Reference Books

4. Devid A. Bell " **Electronics Devices and Circuits**", 5th Edition, OXFORD University Press 2008
5. Jacob Millman/ Christos C. Halkias/ Satyabrata Jit "**Electronics Devices and Circuits**", 3rd Edition , TMH 2008

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication

Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of Horizontal (Peer group): Importance of technical communication; Barriers to Communication.

Unit-II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication

Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.

Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

Text Book

1. Improve Your Writing ed. V.N.Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NAS 102/ NAS 202

ENGINEERING CHEMISTRY

L	T	P
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UNIT-I

Molecular orbital theory and its applications in diatomic molecules. Band theory of solids. Lequid crystals. Application of liquid crystals. Types of unit cell, space lattice (only cubes), Bragg's equation. Calculation of density of unit cell. One and two dimensional imperfections in solids. Structure and applications of Graphite and Fullerenes.

UNIT-II

Polymers, its classification and their applications. Chain and Step growth polymerization. Thermoplastic and Thermosetting resins. Elastomers and synthetic fibres. Conducting and biodegradable polymers. General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization and catalysis.

UNIT-III

Stereochemistry with special reference to optical isomerism. Types of organic reactions with special reference to elimination and substitution reaction. Elementary ideas and simple applications of UV, Visible, IR and ^{1H}NMR spectral Techniques.

UNIT-IV

Hardness of water. Disadvantage of hard water. Techniques for water softening; Calgon, Zeolite, Lime-Soda, Ion exchange resin, Reverse osmosis. Water treatment method for boiler feed by internal process. Phase Rule and its application to one component system (water and sulphur).

UNIT-V

Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values. Biogas and Biomass. Cement and its application. Plaster of paris. Lubricant. Corrosion; causes and prevention.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

NME-102/202: Engineering Mechanics: L T P [3 1 0]

Unit	Topic	Contact Hours
I	**Force Systems:** • Basic concepts: Definitions, Basic assumptions, Scalar & Vector quantities, Free, Forced and fixed vectors. • Force System: Force, Classification & Representation, Force as a Vector, Composition of forces, Parallelogram Law, Resolution, Principle of Transmissibility of forces • Moment of a force, Vector representation, Moment for coplanar force system, Varignon's theorem • Couple, Vector representation, Resolution of a force into a force and a couple. • Force Systems: Coplanar Concurrent Force system and Coplanar Non Concurrent force systems, Resultant of coplanar force system. • Equilibrium of coplanar force system, Free body diagrams, Determination of reactions, Equilibrium of a body under three forces, Lami's theorem. **Friction:** • Introduction, Wet and Dry friction, Theory of Dry friction, Angle of friction, Angle of Repose, Cone of friction, Coulomb's laws of friction.	**8**
II	**Basic Structural Analysis:** • **Plane Truss**, Difference between truss and frame, Perfect and imperfect truss, Assumptions and Analysis of Plane Truss , Method of joints, Method of section, Zero force members. • Beams, Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.	**8**
III	**Centroid and Moment of Inertia:** • Center of Gravity, Center of Mass and Centroid of curves, areas, volumes, Determination of centroid by integration, Centroid of composite bodies. • Definition of Moment of inertia of area, Perpendicular axis theorem and Polar moment of Inertia, Parallel axis theorem, Moment of inertia of simple areas by integration, Moment of Inertia of Composite Areas. • Moment of Inertia of masses, Parallel axis theorem for mass moment of inertia, Mass moment of inertia of simple bodies by integration, Mass moment of inertia of composite bodies.	**8**
IV	**Kinematics of Rigid Body:** • Introduction, Absolute motion, Plane rectilinear motion of rigid body, Plane curvilinear Motion of rigid body, x-y and n-t components, Rotation of rigid bodies, Relative Motion, Plane Motion of rigid bodies, Instantaneous center of zero velocity **Kinetics of Rigid Body:** • Introduction, Force, Mass and Acceleration, Newton's law of	**9**

	motion, D'Alembert's Principles and Dynamic Equilibrium, Laws of motion applied to planar translation, rotation and plane motion. • Work and Energy, Kinetic energy, Principle of work and energy, Conservative forces, Law of conservation of energy, • Linear Impulse and Momentum, Conservation of linear momentum.	
V	**Mechanics of Deformable Solids:** • **Simple stress and strain**: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy. • **Bending of Beams**: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections. • **Theory of Torsion**, Torque and twist, Shear stress due to torsion circular sections.	**08**

References:

1. "Engineering Mechanics: Statics" , J.L Meriam , Wiley
2. "Engineering Mechanics: Dynamics" , J.L Meriam , Wiley
3. "Engineering Mechanics " , F L Singer
4. "Engineering Mechanics : Statics and Dynamics", R. C. Hibbler, Pearson
5. "Engineering Mechanics " , Thimoshenko & Young , 4ed, Tata McGraw Hill
6. "Engineering Mechanics: Statics and Dynamics", A. Nelason, McGraw-Hill
7. "Engineering Mechanics : Statics and Dynamics", Shames and Rao, Pearson
8. "Engineering Mechanics : Statics and Dynamics", S. Rajasekaran and G. Sankarasubramanian, Vikas
9. "Engineering Mechanics", V. Jayakumar and M. Kumar, PHI
10. "Engineering Mechanics", D. P. Sharma, PHI
11. "Engineering Mechanics", M. V. Sheshagiri Rao, and D. Rama Durgaiah, University Press.
12. "Engineering Mechanics" , K L Kumar and V. Kumar, McGraw Hill
13. "Engineering Mechanics" , Bhattacharya , Oxford Press
14. "Engineering Mechanics " , Dr Sadhu Singh , Umesh Publications
15. "Engineering Mechanics " , Bhavikatti , New Age
16. "Strength of Materials" F. L.Singer
17. "Strength of Materials" Thimoshenko & Young
18. "Mechanics of Solids", R. C. Hibbler, Pearson
19. "Mechanics of Solids", A. Mubeen, Pearson

NEE101/NEE201: ELECTRICAL ENGINEERING

L T P 3 1 0

Unit-I

1. D C Circuit Analysis and Network Theorems:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation

Kirchhoff's laws; Loop and nodal methods of analysis; Star-delta transformation

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems) 9

Unit-II

2. Steady- State Analysis of Single Phase AC Circuits:

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Causes and problems of low power factor, Concept of power factor improvement (Simple numerical problems) 8

Unit-III

3. Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems). 3

4. Measuring Instruments:

Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers) 4

Unit-IV

5. Introduction to Earthing and Electrical Safety:

Need of Earthing of equipment and devices, important electrical safety issues. 2

6. Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Mutual coupling with dot convention, Magnetic circuit calculations. 3

7. Single Phase Transformer:

Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer. 3

Unit-V

8. Electrical Machines:

Concept of electro mechanical energy conversion

DC machines: Types, EMF equation of generator and torque equation of motor, Characteristics and applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Types, Principle of operation, Slip-torque characteristics, Applications

(Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications. 8

Text Books:

1. "Principles of Electrical Engineering", V. Del Toro,; Prentice Hall International
2. "Basic Electrical Engineering", D P Kothari, I.J. Nagarath; Tata McGraw Hill
3. "Basic Electrical Engineering", S N Singh; Prentice Hall International
4. "Fundamentals of Electrical Engineering", B Dwivedi, A Tripathi; Wiley India
5. "Basic Electrical Engineering", Kuldeep Sahay, New Age International Publishers

Reference Books:

1. "Electrical and Electronics Technology", Edward Hughes; Pearson
2. "Engineering Circuit Analysis", W.H. Hayt & J.E. Kimerly; Mc Graw Hill
3. "Basic Electrical Engineering", C L Wadhwa; New Age International
4. "Basic Electrical Engineering", T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

NCS-101/NCS-201 Computer System and Programming in C

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Unit1 (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2 (8 Lectures)

Standard I/O in C, Fundamental data types- Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external**,** Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program**,** writing and executing the first C program, components of C language. Standard I/O in C.

Unit3 (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch**,** program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4 (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5 (8 Lectures)

Pointers: Introduction, declaration, applications

File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

NAS-101: ENGINEERING PHYSICS-I

Unit - I

Relativistic Mechanics **06 Hrs**.

Inertial & non-inertial frames, Michelson- Morley experiment, Einsteins postulates, Lorentz transformation equations, Length contraction & Time dilation, Addition of velocities; Variation of mass with velocity, Mass energy equivalence.

Unit - II **06 Hrs.**

Modern Physics

Wave Mechanics: Wave- particle duality, de-Broglie matter waves, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation – particle in one dimensional potential box, Eigen values and Eigen function.

Unit - III **10 Hrs.**

Wave Optics

Interference: Interference of light, Interference in thin films (parallel and wedge shaped film), Newton's rings.

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate.

Unit - IV **08 Hrs.**

Modern Optics

Laser: Spontaneous and stimulated emission of radiation, population inversion, concept of 3 and 4 level Laser, construction and working of Ruby, He-Ne lasers and laser applications.

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special theory of - Robert Resnick - Wielly
3. Optical Fibre & Laser - Anuradha De. (New Age)
4. Optics –Aloy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
5. Optics - Brijlal & Subramanian (S. Chand)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NME-101/201: Basic Manufacturing Processes L T P [2 0 0]

Unit-I Engineering Materials

Materials and Civilization, their socio economic impact. Engineering Materials their classification and applications. **1**

Metals & Alloys: Properties and Applications

Mechanical Properties of Materials: Strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, malleability, toughness, hardness, resilience, hardness, machine ability, formability, weld ability. Elementary ideas of fracture fatigue & creep. **2**

Steels and Cast Irons: Carbon steels, their classification based on percentage of carbon as low, mild, medium & high carbon steel, their properties & applications. Wrought iron. Cast iron. Alloy steels: stainless steel, tool steel. **2**

Alloys of Non Ferrous Metals: Common uses of various non-ferrous metals (Copper, Zink, Tin, Magnesium, Lead, Aluminum etc.) & alloys and its composition such as Cu-alloys: Brass, Bronze, Al-alloys. **2**

Unit-II Basic Metal Forming & Casting Processes.

Forming Processes: Basic metal forming operations & uses of such as: Forging, Rolling, Wire & Tube-drawing/making and Extrusion, and their uses.

Press-work: Die & Punch assembly, cutting and forming, its applications.

Hot-working versus cold-working **4**

Casting: Pattern: Materials, types and allowances. Type and composition of Molding sands and their desirable properties. Mould making with the use of a core. Gating system. Casting defects & remedies. Cupola Furnace. Die-casting and its uses. **3**

Unit-III Machining and Welding Operations and their Applications

Machining: Basic principles of Lathe-machine and operations performed on it. Basic description of machines and operations of Shaper-Planer, Drilling, Milling & Grinding. **4**

Welding: Introduction, classification of welding processes. Gas-welding, types of flames and their applications. Electric-Arc welding. Resistance welding. Soldering & Brazing processes and their uses. **3**

Unit-IV Misc. Topics/ Processes

Heat Treatment Processes: Introduction to Heat- treatment of carbon steels: annealing, normalizing, quenching, tempering and case-hardening.

Manufacturing Establishment: Plant location. Plant layout–its types. Types of Production. Production versus Productivity. **1**

Non-Metallic Materials: Common types & uses of Wood, Cement-concrete, Ceramics, Rubber, Plastics and Composite-materials. **3**

Misc. Processes: Introduction to Galvanizing and Electroplating. **1**

Reference Books:

1. "Processes and Materials of Manufacture", Lindberg, PHI
2. "Manufacturing Engineering And Technology", Kalpakjian and Schmid, Pearson
3. "Manufacturing Processes", Kalpakjian and Schmid, Pearson
4. "Manufacturing Processes", H. N .Gupta, R. C. Gupta, Arun Mital, New Age

NAS 105/ NAS 205 : ENVIRONMENT AND ECOLOGY

2 0 0

UNIT-I: Nature of Environment

Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment

Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health

Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education

Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection Environmental education–women and value education

Recommended Textbook:

Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:

1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NAS-203 : Engineering Mathematics - II

L	T	P
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Unit - 1: Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Normal form, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Fourier series of period 2π, Euler's Formulae, Functions having arbitrary periods, Change of interval, Even and odd functions, Half range sine and cosine series, Harmonic analysis.
Solution of first order partial differential equations by Lagrange's method, Solution of second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. **E. Kreyszig, : Advanced Enginnering Mathematics,Volume-II,John Wiley&Sons**
2. **B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.**
3. **R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing Hous**e.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

NAS-202: ENGINEERING PHYSICS- II

Unit - I **07 Hrs**

Crystal Structures and X-ray Diffraction:

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer.

Unit - II **08 Hrs**

Dielectric and Magnetic Properties of Materials:

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius Mussoti-Equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material,

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit - III **06 Hrs.**

Electromagnetic Theory Displacement Current, Equation of continuity, Maxwell's Equations (Integral and Differential Forms), Poynting theorem and Poynting vectors, EM - Wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.

Unit - IV **09 Hrs**

Physics of some Technologically important Materials

Semiconductors: Band Theory of Solids, density of states, Fermi-Dirac distribution, free carrier density(electrons and holes), conductivity of semiconductors, Position of Fermi level in intrinsic and in extrinsic semiconductors.

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene and Carbon nanotubes, Applications of nanotechnology.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

NAS 152/ NAS 252 : ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample usind EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given water sample by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by calorimetric method. The method involves the use of KCN as a colour developing agent and the measurements are carried out at λ_{max} 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

NME-152/NME/252 : Engineering Mechanics Lab

L T P [0 0 2]

(Any 10 experiments of the following or similar experiments suitably designed)

1. To verify the law of parallelogram of forces.
2. To study the equilibrium of a body under three forces.
3. To determine the coefficient of friction of a flat surface.
4. Friction experiment on screw-jack.
5. Experiment based on analysis of truss.
6. To determine the mass moment of inertia of a rotating disc.
7. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
8. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
9. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
10. Simple & compound gear-train experiment.
11. Worm & worm-wheel experiment for load lifting.
12. Belt-Pulley experiment.
13. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
14. Dynamics experiment on momentum conservation
15. Dynamics experiment on collision for determining coefficient of restitution.
16. Experiment on Torsion of Rod/wire

NEE151/NEE251 : ELECTRICAL ENGINEERING LABORATORY

L T P
0 0 2

List of Experiments

Note : A minimum of 10 experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of (i) Superposition theorem (ii) Thevenin's Theorem (iii) Maximum Power Transfer Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor.
6. Determination of parameters of ac single phase series RLC circuit
7. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
8. To study speed control of dc shunt motor using (i) armature voltage control (ii) field flux control.
9. Determination of efficiency of a dc shunt motor by load test \
10. To study running and speed reversal of a three phase induction motor and record speed in both directions.
11. To measure energy by a single phase energy meter and determine error.
12. To study P-N diode characteristics
13. To study full wave and half wave rectifier circuits with and without capacitor and determine ripple factors.
14. To study various logic gates (TTL)
15. To study Operational Amplifier as Adder and Subtractor
16. To study transistor as a switch

NCS-151/NCS-252 : Computer Programming Lab

7-5-13

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

    Between 90-100%--------------Print 'A'
    80-90%----------------------------Print 'B'
    60-80%---------------------------Print 'C'
    Below 60%----------------------Print 'D'
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. WAP to find the minimum and maximum element of the array.
24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain

    Train No.:   integer type
    Train name: string
    Departure Time: aggregate type TIME
    Arrival Time : aggregate type TIME
    Start station: string
    End station : string

    The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

    (i) List all the trains (sorted according to train number) that depart from a particular section.
    (ii) List all the trains that depart from a particular station at a particular time.
    (iii) List all he trains that depart from a particular station within the next one hour of a given time.
    (iv) List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

NEW-151/251 : WORKSHOP PRACTICE

L T P
[0 1 3]

1. Carpentry Shop: 1. Study of tools & operations and carpentry joints. 2. Simple exercise using jack plane. 3. To prepare half-lap corner joint, mortise & tennon joints. 4. Simple exercise on woodworking lathe.

2. Fitting (Bench Working) Shop: 1. Study of tools & operations 2. Simple exercises involving fitting work. 3. Make perfect male-female joint. 4. Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop: 1. Study of tools & operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

4. Welding Shop: 1.Study of tools & operations of Gas welding & Arc welding 2. Simple butt and Lap welded joints. 3. Oxy-acetylene flame cutting.

5. Sheet-metal Shop: 1. Study of tools & operations. 2. Making Funnel complete with 'soldering'.
3. Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop: 1. Study of Single point cutting tool, machine tools and operations. 2. Plane turning. 3. Step turning 4. Taper turning. 5. Threading

7. Foundry Shop: 1. Study of tools & operations 2. Pattern making. 3. Mould making with the use of a core. 4. Casting

NCE-151/251 : Computer Aided Engineering Graphics

L T P

0 1 3

Introduction Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing,
AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints. **2 - Sheets**

Orthographic Projections

Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes **2 - Sheets**

Orthographic Projections of Plane Surfaces (First Angle Projection Only)

Introduction, Definitions–projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only. **1 - Sheet**

Projections of Solids (First Angle Projection Only)

Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions. **2-Sheets**

Sections And Development of Lateral Surfaces of Solids

Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. **1 - Sheet**

Isometric Projection (Using Isometric Scale Only)

Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres. **1-Sheet**

Text Books

1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48th edition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition- 2006.

Reference Books

1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005-Prentice-Hall of India Pvt. Ltd., New Delhi.

Engineering Drawing – M.B. Shah, B.C.Rana, 2ndEdition,2

NAS-151/NAS-251: PHYSICS LAB

L T P
0 0 2

List of Experiments

Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/ Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

MBA First Year

On

Choice Based Credit System

(Effective from the Session: 2016-17)

Dr. APJ Abdul Kalam Technical University, Lucknow
Study and Evaluation Scheme

MBA Evaluation Scheme For Session 2016-17

Semester I

S. No.		Course Title	Credit	Evaluation Scheme				
				Sessional Exams			ESE	Total
				CT	TA	Total		
1	RMB101	Management Concepts and Applications	3	20	10	30	70	100
2	RMB102	Managerial Economics	3	20	10	30	70	100
3	RMB103	Financial Accounting for Managers	4	20	10	30	70	100
4	RMB104	Business Statistics	4	20	10	30	70	100
5	RMB105	Organisational Behaviour	3	20	10	30	70	100
6	RMB106	Marketing Management	4	20	10	30	70	100
7	RMB107	Business Communication	3	20	10	30	70	100
8	RMB108	Computer Application & Management Information System	3	20	10	30	70	100
		TOTAL	**27**					**800**

*** Non credit but qualifying**

Semester II

S. No.		Course Title	Credit	Evaluation Scheme				
				Sessional Exams			ESE	Total
				CT	TA	Total		
1	RMB201	Business Environment	3	20	10	30	70	100
2	RMB202	Human Resource Management	3	20	10	30	70	100
3	RMB203	Business Research Methods	3	20	10	30	70	100
4	RMB204	Financial Management	3	20	10	30	70	100
5	RMB205	Management Accounting & Control	3	20	10	30	70	100
6	RMB206	Production Operation & Supply Chain Management	3	20	10	30	70	100
7	RMB207	Quantitative Techniques for Managers	4	20	10	30	70	100
8	RMB208	Legal Aspects for Business	3	20	10	30	70	100
9	RMB209	Comprehaensive Viva	2					100
		TOTAL	**27**					**900**

*** Non credit but qualifying**

MANAGEMENT CONCEPTS AND APPLICATION

Code : RMB101

Course Objectives:

- The purpose of this course is to expose the student to the basic concepts of management in order to aid the student in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms.
- Discuss the various concepts of planning, Decision making and controlling to help solving managerial problems
- Study and understand management concepts and styles in Global context.
- Familiarising the students with the contemporary issues in management.

Course Credit: 3 **Contact Hours: 36 hours**

UNIT-1

Management practices from past to present, Different levels of management, Managerial skills, Roles& Functions, Manager and Business environment. (7 hours)

UNIT-2

Planning- Objective of planning, planning process, Types of planning, Types of plans, Corporate planning, Management by Objective, Decision-making- types, process & techniques, making decision effective. (7 hours)

UNIT-3

Organising & staffing- Meaning of organization, types of organization, Organization structure, Span of management, Line and staff relationship, Departmentation, Delegation-Centralization and decentralization of authority, Meaning of staffing, Recruitment, selection & placement, Training & development. (8 Hours)

UNIT-4

Directing & Controlling- Principle of directing, Essence of coordination, Basic control process, Different control techniques, Management by exception.

UNIT-5 (7 Hours)

International Perspective: Contemporary issues and international perspective of management. Benchmarking, TQM, 5S.

Course Outcomes: After completing the course student will be able to understand and explain

1. The concept of management and its managerial perspective.
2. It subject will equip students to map complex managerial aspect arise due to ground realities of an organization.
3. They will Gain knowledge of contemporary issues in Management principles and various approaches to resolve those issues.

Employable Skills	**Measuring Tools**
Ability to identify and apply the	**Exercise**

knowledge of subject practically in real life situations	**Workshop** **Quiz** **Classroom Discussions**

Reference Books:

1. Koontz Harold & Weihrich Heinz – Essentials of management (Tata Mc Graw Hill, 5th Edition ,2008)
2. Robbins & Coulter - Management (Prentice Hall of India, 9th Edition)
3. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential.Concepts and Applications Pearson Education, 6th Edition.
4. Weihrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective.
5. James F.Stoner,et al,Management, Pearsons Education Delhi, 2008
6. Principles of Management, George R. Terry & S.G. Franklin, AITBS, Delhi.

Text Books:

1. L. M. Prasad- Principles and Practices of Management, Sulatn Chand & Sons, 7th edition, 2007.

MANAGERIAL ECONOMICS:

Code : RMB102

Course Objective:

- Understand the relative importance of Managerial Economics
- Know how the application of the principles of managerial economics can aid in achievement of business objectives
- Understand the modern managerial decision rules and optimization techniques.
- Be equipped with the tools necessary in analysis of consumer behavior as well as in forecasting product demand
- Understand and be able to apply latest pricing strategies
- Understand and analyse the macro environment affecting the business decision making.

Course Credit: 3 **Contact Hours: 36 hours**

UNIT –I

Basic Concepts and principles: (6 Hrs)

Definition, Nature and Scope of Economics-Micro Economics and Macro Economics. Managerial Economics and its relevance in business decisions. Fundamental Principles of Managerial Economics - Incremental Principle, Marginal Principle, Opportunity Cost Principle, Discounting Principle, Concept of Time Perspective. Equi-Marginal Principle. Utility Analysis. Cardinal Utility and Ordinal Utility.

UNIT –II

Demand and Supply Analysis : (8Hrs)

Theory of Demand. Types of Demand. Determinants of demand , Demand Function ,Demand Schedule , Demand curve , Law of Demand, Exceptions to the law of Demand , Shifts in demand curve , Elasticity of Demand and its measurement. Price Elasticity. Income Elasticity. Arc Elasticity. Cross Elasticity and Advertising Elasticity. Uses of Elasticity of Demand for managerial decision making , Demand forecasting meaning, significance and methods.(numerical Exercises)

Supply Analysis; Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making.

Price of a Product under demand and supply forces

UNIT –III

Production and cost Analysis: (10Hrs)

Production concepts & analysis; Production function, Types of production function ,Laws of production : Law of diminishing returns , Law of returns to scale.

Cost concept and analysis: Cost , Types of costs, Cost output relationship in the short-run. Cost output relationship in the Long-run.

Estimation of Revenue. Average Revenue, Marginal Revenue

UNIT –IV

Market structures : (8Hrs)

Perfect and Imperfect Market Structures , Perfect Competition, features, determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, product differentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership. Pricing Strategies; Price determination, full cost pricing, product line pricing, price skimming, penetration pricing

UNIT –V National Income; Concepts and various methods of its measurement, Inflation, types and causes, Business **(8Hrs)**

Employable Skills	Measuring tool
Ability to forecast demand	Exercise + Workshop
Ability to analyse various market structures	Exercise + Workshop
Ability to appreciate the role of various monetary policy tools in controlling inflation	Exercise + Workshop

Expected Course outcome:

- This course would provide students with the knowledge , tools and techniques to make effective economic decisions under conditions of risk and uncertainty
- Micro economic principles would equip the students with tools and principles which are applied for analyzing the ever changing demand and supply conditions
- The students would be able to apply the basic macroeconomic concepts to analyze the volatility in the business world.

Text Books:

- Managerial Economics, GEETIKA, McGraw-Hill Education 2nd Ed.
- Managerial Economics: Concepts and Applications (SIE), THOMAS & MAURICE, McGraw-Hill Education, 9th Ed
- Managerial Economics, H.L Ahuja, S.Chand, 8th Ed
- Managerial Economics ,D.N.Dwivedi,Vikas Publication, 7th Ed
- Managerial Economics – Theory and Applications, Dr.D.M.Mithani, Himalaya Publications, 7th Ed.

FINANCIAL ACCOUNTING FOR MANAGERS

Code RMB103

COURSE OBJECTIVE:

- To provide a comprehensive treatment of accounting principles, technique and practices.
- To get the students acquainted with fundamental concepts and processes of accounting so that they are able to appreciate the nature of item presented in the annual accounts of an organization.
- To have a basic understanding of significant tools and techniques of financial analysis, which are useful in the interpretation of financial statements.
- To have a brief knowledge about international accounting standards as to have a global competence.

Course Credit: 3 **Contact Hours: 40 hours**

Unit I (6Hrs)

Meaning and Scope of Accounting : Overview of Accounting, Users of Accounting, Accounting Concepts Conventions, Book keeping and Accounting, Principles of Accounting, Basic Accounting terminologies, Accounting Equation , Overview to Deprecation (straight line and diminishing method) .

Unit II(6Hrs)

Accounting Standards and IFRS : International Accounting Principles and Standards; Matching of Indian Accounting Standards with International Accounting Standards, Human Resource Accounting, Forensic Accounting.

Unit III (10 Hrs)

Mechanics of Accounting : Double entry system of Accounting, Journalizing of transactions; Ledger posting and Trial Balance ,Preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Excel Application to make Balance sheet, Case studies and Workshops.

Unit IV(10 Hrs)

Analysis of financial statement: Ratio Analysis- solvency ratios, Profitability ratios, activity ratios, liquidity ratios, Market capitalization ratios; Common Size Statement; Comparative Balance Sheet and Trend Analysis of manufacturing, Service & banking organizations, Case Study and Workshops in analyzing Balance sheet.

Unit V (8 Hrs)

Funds Flow Statement :Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, difference between cash flow and fund flow, preparation of Cash Flow Statement and its analysis.

SUGGESTED READINGS :

Text Books :

1) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management (Vikas, 10th Edition)
2) Essentials of Financial Accountng (based on IFRS), Bhattacharya (PHI,3rd Ed)
3) Ramachandran Kakani- Financial Accounting for Management(TMH ,3rd Edition).
4) PC Tulsian- Financial Accounting (Pearson, 2016)
5) Dhamija - Financial Accounting for managers: (Prentice Hall, 2nd Edition).

Reference Books

1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI,5th Ed)
2) Dhaneshk Khatri- Financial Accouting (TMH,2015)
3) Ambrish Gupta - Financial Accounting: A Managerial Perspective (Prentice Hall, 4th Edition)
4) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
5) Mukherjee - Financial Accounting for Management (TMH, 2nd Edition).

Expected Course Outcome:

- Subject will provide an insight to the concepts and principles for their routine monetary transaction.
- Prepare financial statements in accordance with Generally Accepted Accounting Principles and its excel application.
- Employ critical thinking skills to analyze financial data as well as the effects of differing financial accounting methods on the financial statements.
- Effectively define the needs of the various users of accounting data and demonstrate the ability to communicate such data effectively, as well as the ability to provide knowledgeable recommendations.
- Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures.

  Employable skills

Ability to apply excel techniques for Balance Sheet and Profit and Loss Preparation	Exercise + Workshop
Ability to analyze balance sheet	Exercise
Knowledge about Indian and International Accounting Standards	www.icai.org

BUSINESS STATISTICS

RMB104

Course Objectives

1. To compute and understand the measures of central tendency, symmetrical and asymmetrical distribution, patterns.
2. To understand the time series analysis and to compute index number.
3. Performing Correlation & Compute the equation of simple regression line from a sample data and interpret the slope and the intercept of the equation
4. To understand the probability concepts and perform probability theoretical distributions
5. Use Estimation Theory and Hypothesis Testing concepts & perform various parametric and non parametric tests.

Course Credit: 3 **Contact Hours: 36 hours**

Unit I (10 Sessions): Descriptive Statistics

Scope, functions and limitations of statistics, Measures of Central tendency – Mean, Median, Mode, Percentiles, Quartiles, Measures of Dispersion – Range, Interquartile range, Mean deviation, Mean Absolute deviation, Standard deviation, Variance, Coefficient of Variation. Measures of shape and relative location; Skewness and Kurtosis; Chebyshev's Theorem.

Unit II (8 Sessions):Time Series & Index Number

Time series analysis: Concept, Additive and Multiplicative models, Components of time series,
Trend analysis: Least Square method - Linear and Non- Linear equations, Applications in business
decision-making.
Index Numbers:- Meaning , Types of index numbers, uses of index numbers, Construction of Price, Quantity and Volume indices:- Fixed base and Chain base methods.

Unit III (6 Sessions): Correlation & Regression Analysis

Correlation Analysis: Rank Method & Karl Pearson's Coefficient of Correlation and Properties of Correlation.
Regression Analysis: Fitting of a Regression Line and Interpretation of Results, Properties of Regression Coefficients and Relationship between Regression and Correlation.

Unit IV (8 Sessions): Probability Thoery & Distribution

Probability**:** Theory of Probability, Addition and Multiplication Law, Baye's Theorm
Probability Theoretical Distributions: Concept and application of Binomial; Poisson and Normal distributions.

Unit V (8 Sessions) *Estimation Theory & Hypothesis Testing*

Estimation Theory: Theory of Estimation, Point Estimation, Interval Estimation.
Hypothesis Testing: Null and Alternative Hypotheses; Type I and Type II errors; Testing of Hypothesis: Large Sample Tests, Small Sample test, (t, F, Z Test and Chi Square Test)

Text Book

1. Chandrasekaran & Umaparvathi-Statistics for Managers, 1st edition, PHI Learning
2. G C Beri – Business Statistics, 3rd ed, TATA McGrawHill

Reference Book

1. Davis , Pecar – Business Statistics using Excel, Oxford
2. Ken Black – Business Statistics, 5th ed., Wiley India
3. Levin and Rubin – statistics for Management, 7th ed., Pearson
4. Lind, Marchal, Wathen – Staistical techniques in business and economics, 13th ed, McGrawHill
5. Newbold, Carlson, Thorne – Statistics for Business and Economics, 6th ed., Pearson
6. S. C.Gupta – Fundamentals of Statistics, Himalaya Publishing
7. Walpole – Probability and Statistics for Scientists and Engineers, 8th ed., Pearson

Course Outcome

1. Students should be able to calculate and interpret measures of central tendency, symmetrical and asymmetrical distribution, patterns.
2. To estimate the time series analysis by least square method and to calculate, understand the significance and usage of index number.
3. To calculate and interpret correlation coefficients & Formulate regression line by identifying dependent and independent variables.
4. Students should understand basic concepts of probability and perform probability theoretical distributions.
5. Understand Estimation Theory and to develop understanding of hypothesis testing concepts & perform various parametric and non parametric tests.

Employable Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	Exercise Workshop Quiz Classroom Discussions SPSS AND MS EXCEL

ORGANIZATIONAL BEHAVIOR

RMB105

Course Objectives:

To enhance the understanding of the dynamics of interactions between individual and the organization. –

To facilitate a clear perspective to diagnose and effectively handle human behavior issues in Organizations. –

To develop greater insight into their own behavior in interpersonal and group, team, situations.

Course Credit: 36 Hrs

Unit I: (8 Hours)

Introduction to OB: The meaning of OB, Why study organizational behaviour, Fundamentals of individual behaviour. Determinants of Personality, types of personality. Personal effectiveness. Attitudes: Meaning, Types, Components, Theory of attitude formation and attitude change.

Unit II: (8 Hours)

Foundation of Group Behaviour: Group: Meaning, types, group dynamics, group cohesiveness, Meaning of Interpersonal Behaviour & Interpersonal skills, Transactional Analysis, Johari Window, FIRO – B, MBTI

Unit III: (8 Hours)

Motivation: Meaning & definition, Traditional theory of Motivation: Maslow's, Herzberg's, Mc Clelland, Contemporary theories of Motivation: Self Determination Theory, Self Efficacy Theory, Vroom's Expectancy Theory, Equity Theory, Reinforcement Theory, OB MOD.

Perception: Meaning, process, principles and errors of perception, managerial & behavioural applications of perception.

Unit IV: (8 Hours)

Leadership: What is leadership, types of leaders and leadership styles, traits and qualities of effective leader, trait theory, LSM – Leadership Situational Model, Team Building, Tuckman Model of Team Development.

Unit V: (4 Hours)

Organizational Change: Meaning of organizational change, approaches to managing organizational change, creating a culture for change, implementing the change, Kurt Lewin Model of change.

Employable Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	Exercise Workshop Quiz Classroom Discussions

Course Outcomes: The degree to which one can make an individual to think beyond self is the real outcome of the course. Upon the successful completion of this course, the student will be able to:

1. Analyse the behaviour of individuals and groups in organisations

2. Assess the potential effects of organisational-level factors (such as structure, culture and change) on organisational behaviour.

3.Critically evaluate the potential effects of important developments in the external environment (such as globalisation and advances in technology) on organisational behaviour.

4. Analyse organisational behavioural issues in the context of organisational behaviour theories,

Refrences:

Books:

1. Fred Luthans, “Organizational Behaviour”, 12th Edition, McGraw Hill International Edition

2. Stephen P. Robbins, “Organizational Behaviour”, 12th Edition, Prentice Hall

3. Aswathappa K, “Organizational Behaviour (Text, Cases and Games)”, Himalaya Publication

4. UdaiPareek, “Organizational Behavior”, Oxford University Press

MARKETING MANAGEMENT

RMB106

Course Objectives:

- Assess market opportunities by analyzing customers, competitors, collaborators, context, and the strengths and weaknesses of a company.
- Understand consumers' requirements and their behaviours.
- Develop effective marketing strategies to achieve organizational objectives.
- Communicate and defend your recommendations and critically examine and build upon the recommendations of your classmates both quantitatively and qualitatively.
- Develop the understanding the current global and digital aspect of marketing.

Course Credit: 3 **Contact Hours: 40 hours**

Unit 1(8 hours)

Introduction: Nature and scope of marketing, Evolution, Various marketing orientations, Core concepts of marketing, customer value and the value delivery process. Marketing challenges in the globalized economic scenario.

Understanding Consumer Behavior: Buying motives, factors influencing buying behavior, buying habits, stages in consumer buying decision process, types of consumer buying decisions, Businessbuying and Business buying process.

Unit 2 (8 hours)

Market segmentation, Targeting and Positioning: Meaning, Factors influencing segmentation, Market Aggregation, Basis for segmentation, Segmentation of Consumer and Industrial markets.

Targeting: Meaning, Basis for identifying target customers, Target Market Strategies.

Positioning: Meaning, product differentiation strategies, tasks involved in positioning.

Branding: Concept of Branding, Brand Types, Brand equity, Branding Positioning.

Unit 3 (8 hours)

Product Decisions: Concept, product hierarchy, new product development, diffusion process, Product Life cycle, Product mix strategies and merchandise planning and strategies.

Packaging / Labeling: Packaging as a marketing tool, requirement of good packaging, Role of labeling in packaging

Pricing Decisions: Pricing concepts for establishing value, Pricing strategies-Value based, Cost based, Market based, Competitor based, New product pricing – Price Skimming & Penetration pricing

Unit 4 (8 hours)

Place Decision: Meaning, Purpose, Channel alternatives, Factors affecting channel choice, Channel design and Channel management decisions, Channel conflict, Distribution system, Multilevel Marketing (Network Marketing)

Advertising: Advertising Objectives, Advertising Budget, Advertising Copy, AIDA model, Advertising Agency Decisions, **Public Relation:** Meaning, Objectives, Types, Functions of Public Relations.

Sales Promotion: Sales Promotion Mix, Kinds of promotion, Tools and Techniques of sales promotion, Push-pull strategies of promotion, **Personal selling:** Concept, Features, Functions, Steps/process involved in Personal Selling,

Unit 5 (8 hours)

Direct Marketing: Meaning, Features, Functions, Growth and benefits of direct marketing, different forms, online marketing, and policy issues in Direct Marketing

Global Marketing: current scenario, Global Marketing environment, Entry strategies, Global P's of Marketing.

TEXT BOOKS:

1) Marketing Management: A South Asian Perspective - Kotler, Keller, Kevin 15/e, Pearson Education, 2016.
2) Marketing Management - Ramaswamy V. S. &Namakumar S, 5/e, McGrawHill Education Publishers, 2015.
3) Marketing Management - Tapan Panda, 5/e, Excel Publication, 2007.
4) Fundamentals of Marketing Management - Etzel M. J, B J Walker & William J. Stanton, 14/e, McGrawHill Education Publishers, 2015.
5) Marketing: Asian EditionPaul Bainies, Chris Fill Kelly Page third edition, Oxford.

REFERENCE BOOKS:

1) Marketing: An Introduction - Rosalind Masterson & David Pickton, 2/e, Sage Publications, 2010.
2) Marketing Management- Russ Winer, Ravi Bhar 4/e Pearson Edication 2015.
3) Managing Marketing, Noel Capon, SidharthShekar Singh, 4/e Wiley
4) Marketing: Lamb, Hair, Mc Danniel, Cengage Learning 2012.

Expected Course Outcome:

- Explain and discuss the general concepts about marketing management and the marketing process.
- Discuss consumer and buyer behaviour models as they influence customer purchase decision-making.
- Explain the concepts of segmentation, targeting and positioning as part of a comprehensive Marketing plan.
- Develop a set of skills important to successful performance in marketing management positions, including critical thinking, working in a group environment, oral and written presentation skills.
- Explain the prospect of the global market and application of digitalization to reach there.

Employable Skills	**Measuring Tools**
Ability to identify and apply the knowledge of subject practically in real life situations	Exercise Workshop Quiz Classroom Discussions

Business Communication

RMB107

Course Objectives

1: To understand business communication strategies and principles for effective communication in domestic and international business situations.

2: To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.

3: To develop the ability to research and write a documented paper and/or to give an oral presentation.

4 : To develop the ability to communicate via electronic mail, Internet, and other technologies for presenting business messages.

5: To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument.

Course Credits 3 **Hours 36 Hrs**

UNIT 1: (8 hrs)

Introduction: Role of communication – defining and classifying communication – purpose of communication – process of communication –characteristics of successful communication – importance of communication in management – communication structure in organization – communication in crisis - barriers to communication.

Unit 2: (7 hrs)

Oral communication: What is oral Communication – principles of successful oral communication –what is conversation control – reflection and empathy: two sides of effective oral communication – effective listening – non – verbal communication. Written communication: Purpose of writing – clarity in writing – principles of effective writing – approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – coherence – electronic writing process.

Unit 3: (7 hrs)

Business letters and reports: Introduction to business letters – writing routine and persuasive letters – positive and negative messages- writing memos – what is a report purpose, kinds and objectives of report writing. Presentation skills: What is a presentation – elements of presentation – designing a presentation. Advanced visual support for business presentation types of visual aid

Unit 4: (7 hrs)

Employment communication: Introduction – writing CVs – Group discussions – interview skills Impact of Technological Advancement on Business Communication Communication networks – Intranet – Internet – e mails – SMS – teleconferencing – video conferencing .

Unit 5: (7 hrs)

Group communication: Meetings – Planning meetings – objectives – participants – timing – venue of meetings – leading meetings. Media management – the press release press conference – media interviews Seminars – workshop – conferences. Business etiquettes.

Suggested Readings:

1. Bovee & Thill – Business Communication Essentials A Skill – Based Approach to Vital Business English. Pearson.
2. Bisen & Priya – Business Communication (New Age International Publication)
3. Kalkar, Suryavanshi, Sengupta-Business Communication(Orient Blackswan)
4. Business Communication : Skill, Concepts And Applications – P D Chaturvedi, Mukesh Chaturvedi Pearson Education.
5. Asha Kaul, Business Communication, Prentice Hall of India.

EMPLOYABLE SKILLS

Skill	**Measurement tool**
Understanding of fundamentals of business communication strategies.	Presentations, Quiz
Apply suitable modes of expression.	Role Play followed by discussion
Compose accurate business documents	Group assignment/ Workshop/ Exercise.
Develop skills to use latest technology used for communication	Group project, presentations
Develop group communication skills.	Role play, Debate, Case study analysis

Course Outcomes

Upon successful completion of this course, the student should be able to:

1. Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
2. Identify ethical, legal, cultural, and global issues affecting business communication.
3. Utilize analytical and problem solving skills appropriate to business communication.
4. Participate in team activities that lead to the development of collaborative work skills.
5. Select appropriate organizational formats and channels used in developing and presenting business messages.
6. Compose and revise accurate business documents using computer technology.
7. Communicate via electronic mail, Internet, and other technologies.
8. Deliver an effective oral business presentation.

Computer Applications and Management Information System

RMB108

COURSE OBJECTIVES:

- The course aims to provide knowledge about basic components of a computer and their significance.
- To provide hands on learning of applications of MS Office and Internet in businesses.
- To provide an orientation about the increasing role of management information system in managerial decision making to gain Competitive edge in all aspects of Business.
- To understand various MIS operating in functional areas of an organization.
- To create awareness in upcoming managers, of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision making.

Course Credits 3 **Hours 36 Hrs**

Unit I (05 hours) Conceptual Framework

Hardware: (a) Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display Unit, printers, plotters (c) Storage
Devices – Magnetic storage devices, Optical storage devices, Flash Memory.
Software:Types of software with examples; Introduction to languages, compiler, interpreter and
Assembler, Operating System Functions, Types and Classification, Elements of GUI based operating system.

Unit II (06 hours)Communication Technology

Network and Internet: Types of computer networks (LAN, WAN and MAN), Network topologies, EDI.
Internet: Netiquettes, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail.

Unit III (12 hours)Office tools for Business

Use of MS-Office:Word: Paragraph formatting, Page formatting, Header and footer, Bullets and numbering, Finding and replacing text, Mail merge, Macros.
Cell referencing, Ranges.
Excel: Formulae, Functions, Auto sum, Copying formula, Formatting data, creating charts, creating
Database, sorting data, filtering.

Power Point: Formatting text on slides, Inserting charts, adding tables, Clipping, Slide animation, Slide shows.

Unit IV (7 hours) Information System Classification

Concept of Data and Information, Operations SupportSystem (OSS), Management Support System(MSS), Transaction Processing System(TPS), Process ControlSystem (PCS), Enterprise Collaboration System(ECS), Management Information System(MIS), DecisionSupport System (DSS), Executive Information System(EIS).
Artificial Intelligence (AI), Applications of Artificial Intelligence: Neural Networks, Fuzzy Logical Control System, Virtual Reality, Expert System (ES).

Unit V (06 hours) Information Systems for Business

Applications: Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges Of IT, Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues, Cyber Laws, IT Act 2000.

Suggested Readings

1. Shrivastava-Fundamental of Computer& Information Systems (Wiley Dreamtech)
2. Leon A and Leon M - Introduction to Computers (Vikas, 1st Edition).
3. ITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
4 ITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
5. Introduction to Computers, Norton P. (TATA McGraw Hill)
6. Leon - Fundamentals of Information Technology, (Vikas)

Expected Course Outcomes:

- Have an in-depth knowledge of IT enabled competitive advantage and organizational change.
- Grasp essential of major components of Information technology and various information systems.
- Become familiar in the use of tools such as Excel, Word and power point for modelling and solving Business problems.
- Become familiar about the design and implementation issues related to the development of information systems for Business applications.

Business Environment

Code RMB201

Corse Objectives:

- The basic objective of the course is to develop understanding and provide knowledge about business environment to the management students.
- To promote basic understanding on the concepts of Business Environment and to enable them to realize the impact of environment on Business.
- To provide knowledge about the Indian and international business environment.

Unit 1

Introduction- (8Hrs)

Business – Meaning, Definition, Nature & Scope, Types of Business Organizations , Business Environment- Meaning, Characteristics, Scope and Significance, Components of Business Environment.

Introduction to Micro-Environment – Internal Environment: Value system, Mission, Objectives, Organizational Structure, Organizational Resources, Company Image, Brand Equity External Environment: Firm, customers, suppliers, distributors, Competitors, Society, Introduction to Macro Components – Demographic, Natural, Political, Social, Cultural Economic, Technological, International and Legal) Difference between macro and micro environment.

Unit 2

Economic, Political and Legal environment (8Hrs)

Political Institutions- Legislature, Executive, Judiciary, Role of government in Business, Legal framework in India. Economic environment- economic system and economic policies. Concept of Capitalism, Socialism and Mixed Economy ,Impact of business on Private sector, Public sector and Joint sector , MRTP and fema, Monetary and fiscal policies

Unit 3 (8Hrs)

A) Social and Cultural Environment – Nature, Impact of foreign culture on Business, Traditional Values and its Impact, Social Audit – Meaning and Importance of Corporate Governance and Social Responsibility of Business Business ethics

B) Competitive Environment – Meaning, Michael Porter's Five Forces Analysis, Competitive Strategies

Unit 4 (4 Hrs)

Natural and Technological Environment: Innovation, technological leadership and followership, sources of technological dynamics, impact of technology on globalization, transfer of technology, time lags in technology introduction, Status of technology in India; Management of technology; Features and Impact of technology.

Unit 5
International Environment – **(12Hrs)**

International forces in Business Environment, SEZ, EPZ, GATT/ WTO, Globalization – Meaning , Nature and stages of Globalization, features of Globalization, Foreign Market entry strategies, LPG model. MNCs – Definition, meaning, merits, demerits, MNCs in India

Employable Skills:

Employable Skill	Measurement tool
Entrepreneurial skill	Workshop on business planning
Managerial competitive skill	Assignment on swot analysis
Business acumen	Case studies

Course Outcome : Upon successful completion of this course , the student will be able to:

1. Demonstrate an understanding of the forces that shape the business and economic structure
2. Explain why business ethics is an integral part of every business organization.
3. Understand the business and related factors; and business's dependency on the interactions with different environmental variables.
4. Develop analytical skills and widen the understanding of macro environmental issues by applying the knowledge of macroeconomic policies and their impact on business organization and strategy.

Journals / Magazines, business world , business today

Books Recommended:
1. Business Environment: Test and Cases , PAUL, Mc Graw Hill Education , 3rd Ed.
2. Business Environment ---Francis Cherunilam, Himalaya Publishing House
3. V. Neelamegam – Business Envirnoment (Vrinda Publications , 2nd Edition)
4. Shaikh & Saleem - Business Environment (Pearson, 2nd Edition)
5. International Business Environment—Ian Brooks, Jamie Weatherstom and Grahm Wilkinson

HUMAN RESOURCE MANAGEMENT

Code RMB202

Course Objectives: In this course the students will learn the basic concepts and frameworks of Human Resource Management (HRM) and understand the role that HRM has to play in effective business administration. It will provide an insight as to how to use Human Resource as a tool to implement strategies.

Course Credit: 36 Hrs

UNIT I: (6 Hours)

Essentials of HRM: Nature of HRM, Scope, functions and importance of HRM, HRM vs.HRD, SHRM: Introduction, characteristics and scope of SHRM, SHRM vs. Conventional HRM, Barriers to strategic HRM, Linking HR strategy with business strategy, HRM linkage with TQM & productivity.

UNIT II: (8 Hours)

Human Resource Planning and Employee Hiring : Nature of job Analysis, job design, Human Resource Planning, Demand forecasting for manpower planning, HR supply forecasting, factors influencing HRP, Employee hiring- Nature of Recruitment, Sources of recruitment, Employee selection, process of employee selection, recent trends in recruitment.

UNIT III: (8 Hours)

Employee Training & Development: Nature and importance of Training, methods and types of training, career planning, promotion, transfer, demotion and separation, Performance Appraisal: Meaning and types of appraisal, Job Evaluation: Meaning and methods of job evaluation.

UNIT IV: (8 Hours)

Compensation Management and Employee Relations: Introduction to compensation management, Components of employee and executive compensation, Factors affecting employee compensation, Employee incentive schemes, and recent trends in compensations management. Meaning and nature of employee relation and industrial relations.

UNIT V: (6 Hours)

Employee Safety/ Health and International Human Resource Management: Basics of ethics and fair treatment at work, measures and policies for employee safety at work, basic principles governing International Human Resource Management and the role of culture.

Employable Skills	Measuring Tools

Ability to identify and apply the knowledge of subject practically in real corporate situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

Course Outcomes: After the successful completion of the course the students will be in a position to address the challenges of organizational management through and with human resources. In addition it will help in:

1. synthesize the role of human resources management as it supports the success of the organization including the effective development of human capital as an agent for organizational change.
2. demonstrate knowledge of laws that impact behaviour in relationships between employers and employees that ultimately impact the goals and strategies of the organization.
3. understand the role of employee benefits and compensation as a critical component of employee performance, productivity and organizational effectiveness.
4. show evidence of the ability to analyze, manage and problem solve to deal with the challenges and complexities of the practice of collective bargaining.
5. demonstrate knowledge of practical application of training and employee development as it impacts organizational strategy and competitive advantage.

References: Books:

1. V.S.P.Rao, Human Resource Management (Text and Cases) Himalaya Publications, Thirtienth Edition.
2. Durai Praveen, Human Resource Management Pearson Publication, 2nd Edition.
3. Gary Dessler and BijuVarkkeyH uman Resource Management, Person Publication, 2013, 14th Edition.
4. Seema Sanghi, Human Resource Management, Vikas Publlications, 2014, 5th Edition.
5. K. Aswathappa, Human Resource Management, McGraw Hill Education, 2013, 7th Edition.

BUSINESS RESEARCH METHODS

Code RMB203

Course Objectives:

- To acquire skills to locate problem areas in organisational settings, and plan, organise, design, and conduct research to help solve the identified problems;
- To facilitate students in making their own research study.
- To make reader Understand and practice a good standard questionnaire.
- To learn use of statistical analysis in packages available in the market.
- To familiarize research reports; and develop skills and knowledge to prepare research reported in academic and business.

Unit 1

Research: – Definition, Meaning, Importance types and Qualities of Research; Research applications in functional areas of Business, Emerging trends in Business research.
Research & the Scientific Method: Characteristics of scientific method. Steps in Research Process
Concept of Scientific Enquiry: – Formulation of Research Problem – Management Question – research Question – Investigation Question
Research Proposal – Elements of a Research Proposal, Drafting a Research Proposal, evaluating a research proposal.

Unit 2

Research design: Concept, Features of a good research design, Use of a good research design; Qualitative and Quantitative research approaches, Comparison – Pros and Cons of both approaches.
Exploratory Research Design: Concept, Types: Qualitative techniques – Projective Techniques, Depth Interview, Experience Survey, Focus Groups, Observation.
Descriptive Research Designs: Concept, types and uses. Concept of Cross-sectional and Longitudinal Research
Experimental Design: Concept of Cause, Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.

Unit 3

Scaling & measurement techniques: Concept of Measurement: Need of Measurement; Problems in measurement in management research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.
Attitude Scaling Techniques: Concept of Scale – Rating Scales viz. Likert Scales, Semantic Differential Scales, Constant Sum Scales, Graphic Rating Scales – Ranking Scales – Paired comparison & Forced Ranking – Concept and Application.

Unit 4

Sampling: Basic Concepts: Defining the Universe, Concepts of Statistical Population, Sample, Characteristics of a good sample. Sampling Frame (practical approach for determining the sample frame expected), Sampling errors, Non Sampling errors, Methods to reduce the errors, Sample Size constraints, Non Response.
Probability Sample: Simple Random Sample, Systematic Sample, Stratified Random Sample, Area Sampling & Cluster Sampling.
Non Probability Sample: Judgment Sampling, Convenience Sampling, Purposive Sampling, Quota Sampling & Snowballing Sampling methods. Determining size of the sample – Practical considerations in sampling and sample size, sample size determination.

Unit 5

Data Analysis: Editing, Coding, Tabular representation of data, frequency tables, Construction of frequency distributions, Graphical Representation of Data: Appropriate Usage of Bar charts, Pie charts, Histogram, Leaf and stem, Candle stick, Box plots.
Bi-variate Analysis: Linear Regression Analysis: Meaning and two lines of regression; relationship between correlation and regression co-efficient, Cross tabulations, Chi-square test;
Hypothesis: Qualities of a good Hypothesis –Framing Null Hypothesis & Alternative Hypothesis. Concept of Hypothesis Testing – Logic & Importance.
Test of Significance: Small sample tests: t (Mean, proportion) and F tests, Z test, on-parametric tests: Binomial test of proportion, Randomness test; Analysis of Variance: One way and two-way Classifications, Interpretation of the given data and scenario analysis is expected for appropriate managerial decision inferences to be drawn.

TEXT BOOKS:

1) Business Research Methods, Naval Bajpai, Pearson Education
2) Research Methodology, C R Kothari, New Age International.
3) Research Methodology, Deepak Chawla, NeenaSondhi, Vikas Publication
4) Business Research Methods by Donald Cooper & Pamela Schindler, TMGH, 9th Edition.
5) Business Research Methods by Alan Bryman & Emma Bell, Oxford University Press, 2ndEdition.

Employable Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

REFERENCE BOOKS:

1) Methodology of Research in Social Sciences, Krishnaswamy O R,Himalaya Publishers.
2) Marketing Research, Paneerselvam, PHI, 2004
3) Research Methods for Business and Social Science, John Adams, Hafiz T A Khan, Robert Raeside , Sage Pubs, Second Edition.
4) Management Research Methods, Phyllis Tharenou, Ross Donohue, Brian Cooper, Monash University, Victoria, November 2007.
5) Research Methodology: Cases and concepts – Deepak Chawla &NeenaSondhi, Vikas, 2011.

Expected Course Outcome:

- Reader can clearly differentiate Research and management problem.
- Students can have confident in making their own research proposal.
- Students would have a strong knowledge in preparing well structured questionnaire in all respect.
- Students would have not only theoretical/conceptual but also the knowledge in working with statistical packages.
- Reader would get the skill to convert the research into presentable article.

FINANCIAL MANAGEMENT

RMB204

Course Objective

- To gain an understanding on the use of basic business financial management concepts and tools of analysis such as valuation.
- To gain an insight into various types of financing available to a firm.
- To have an understanding of various factors considered in designing the capital structure.
- To acquaint the students about key areas related to investment and Working Capital Management.
- To gain an insight into various techniques of dividend and retention ratio.

Unit I (6 Hrs)

Concept of Finance : Finance & its scope Financial Decisions, Sources of Finance Time Value of Money ,Profit maximization vs. Wealth maximization, Functions of Finance Manager in Modern Age, Indian Financial System : Primary and Secondary Market, Concept of Risk and Return , CAPM Model.

Unit II (10 Hrs)

Investment Decision : Concept of Opportunity Cost, Cost of Debenture, Preference and Equity capital, Composite Cost of Capital ,Cash Flows as Profit and components of Cash Flows , Capital Budgeting Decisions, Calculation of NPV and IRR, Excel Application in Analyzing Projects.

Unit III(10 Hrs)

Financial Decision :Capital Structure, Relevance and Irrelevancy theory ,Leverage analysis – financial, operating and combined leverage along with its implications, EBIT EPS Analysis, Point of Indifference .

Unit IV (10 Hrs)

Dividend Relevance: Factors affecting Dividend Policy, Forms of Dividends , Types of Dividend Policies , Dividend Models :Walter and Gordon Model, Miller- Modigliani(MM) Hypothesis .

Unit V (4 Hrs)

Working Capital Management: Concepts of Working Capital and its types, Determinants of Working Capital, Adequate Working Capital, Working Capital Financing

Text Books :

1) Khan and Jain - Financial Manage ment (Tata McGraw Hill, 7th Ed.)
2) Pandey I M - Financial Management (Vikas, 11th Ed.)
3) William HakkaBettner Carcello- Financial and Management Accounting(TMH-16th Ed.)
4)Sheeba kapil-Fundamental of financial management (Wiley,2015)

5) Prasanna Chandra - Fundamentals ofFinancial Management (TMH, 9th Ed.)
6) Bark Demazo Thampy- Financial Management (Pearson,2nd Ed.)
7) R P Rustagi - Financial Management(Galgotia, 2000, 2nd revised ed.)

Reference Books :

1.) Ravi.M Kishore – Financial Management (Taxman ,7th Ed)
2.) Fundamentals to Financial Mangement , Brigham & Houston, 14/e ,Cengage Learning
3.) Van Horne - Financial Management and Policy (Prentice hall, 2003, 12th Ed.)
4.) Horne Wachowicz- Fundamentals of Financial Management (Pearson,13th Ed)
5.) Lawrence J.Gitman – Principles of Managerial Finance (Pearson Education, 2004)

Course Outcome : After reading this course students will be able to reach the following outcomes:

1. Apply techniques to project financial statements for forecasting long-term financial needs.
2. Explain the role of short-term financial management, and the key strategies and techniques used to manage cash, marketable securities, accounts receivable and inventory.
3. Apply future value and present value concepts to single sums, mixed streams, and annuities.
4. Identify relevant cash flows for capital budgeting projects and apply various methods to analyze projects.
5. Apply techniques for estimating the cost of each component of the cost of capital and understand how to assemble this information into a cost of capital and Capital structure.
6. Explain the concept of leverage and the benefits and costs associated with debt financing.
7. Apply techniques of dividend and retention ratio .

Employable skills

Understanding of financial theory to enable students to enhance corporate financing decisions	Case Study
Understanding major techniques used in long term corporate investment management	Excel Analysis
Basic insight about schemes , interest rates of various sources of finance	www.bankrate.com + Newspaper

Management Accounting And Control

RMB205

Course Objectives:

- To have a basic understanding of various types of costs and their relevance in decision making
- To have an understanding of Marginal Costing Technique and its application in decision making
- To gain an insight into the concept of breakeven point and its applications
- To understand the concept of Variance and calculate various types of variances
- To apply the technique of budgeting in preparation of various types of budgets

UNIT I

Introduction : Nature and scope of cost Accounting and Management Accounting , Cost Accounting VS Management Accounting vs Financial Accounting and their interrelationships , Advantages and limitations of cost accounting , types of cost , Elements of cost - Materials, Labour and overheads, Role of Cost in decision making preparation of cost sheet, Reconciliation of Cost and Financial Accounting. (8Hrs)

UNIT II

Marginal Costing : Concept of Marginal cost ,Product and period costs, Marginal costing, Absorption Costing, Marginal Costing versus Absorption Costing, Income statement under Absorption and Marginal Costing , Applications of Marginal Costing, (4Hrs)

Cost-Volume-Profit Analysis : Concept of contribution and P/V Ratio, CVP Analysis, Break even analysis, Methods of Break Even Analysis, Graphic presentation of Break Even Analysis , Margin of safety, Multi product situations , Sales mix and Break Even Point (4Hrs)

UNIT III

Budgetary Control : Concept of Budget, Budgeting and Budgetary Control, Objectives , advantages and limitations of budgetary control, essentials of effective budgeting , Types of Budget, Static and Flexible Budgeting, Preparation of Cash Budget, Sales Budget, Production Budget, Materials Budget, Capital Expenditure Budget and Master Budget, Zero Base Budgeting (10Hrs)

UNIT IV

Standard Costing and Variance Analysis: Concept of standard costs, establishing various cost standards, Concept of standard costing , Advantages and limitations of standard costing , Standard costing vs budgetary control , Variance Analysis : calculation of Material Variance, Labour Variance, and Overhead Variance, and its applications and implications. (10Hrs)

UNIT V

Neo Concepts : Responsibility Accounting : Concept and various approaches to Responsibility Accounting, Types of responsibility centres , Measuring divisional performance , Transfer Pricing : concept & importance , Method of transfer pricing , Activity Based Costing, Target Costing & Life Cycle Costing (4Hrs)

Employable Skills	Measuring tool
Ability to Prepare budget	Exercise + Workshop
Ability to analyse cost variance	Exercise + Workshop
Ability to apply CVP analysis for different decisions	Exercise + Workshop

Expected Course outcome:

- Demonstrate an understanding of the context within which Management Accounting is used for planning and control purposes.
- Appreciate how budgets and variances are used to control and measure performance.
- Understand the use of various costing systems and techniques
- Measure and analyse performance using appropriate variances.
- Prepare cost estimates using appropriate assumptions.
- Appreciate the impact on management information of using different costing systems and techniques.

Text Books

- Management Accounting: Text Problems and Cases, KHAN and Jain, McGraw-Hill Education 6th Edition
- Modern Cost And Management Accounting, HANIF, McGraw-Hill Education ,1st edition
- Cost and Management Accounting, M.N.Arora, Himalaya publishing house 3rd edition
- Management Accounting, Pandey IM , Vikas Publication, 3rd edition
- Introduction to Management Accounting, Horngren et al, Prentice Hall
- Managerial Accounting, Paresh Shah, Oxford , 2nd ed.

Production Operations and Supply Chain Management

RMB206

COURSE OBJECTIVES:

- To understand the role of Operations in overall Business Strategy of the firm.
- To understand the application of operations management policies and techniques to the service sector as well as manufacturing firms.
- To identify and evaluate the key factors and their interdependence of these factors in the design of effective operating systems.
- To familiarize the students with the techniques for effectiveutilization of operational resources and managing the processes to produce good quality products andservices at competitive prices.

Unit –I (4 sessions) Production Concept

Difference between production and Operation Management, Productivity, Productivity measurement, Factors affecting Productivity.

Production Technology – Types of Manufacturing processes

Unit –II (6 sessions)Operation Concept

Difference between product and service, Product and service design, Characteristics of service, Classification of service, factors affecting service operations, Service capacity planning, SERVQUAL model of measuring service quality.

Unit-III (10 sessions)Material and Inventory Management

Types of production planning, process of production planning and control – Routing, Scheduling, Loading, Types of inventories, Inventory control techniques- VED, EOQ,Just-in-time (JIT).

Factors affecting Plant Location, Types of Plant layout.

Unit-IV (10 sessions)Supply Chain Management

Conceptual model of SCM, Supply chain drivers, demand forecasting in Supply Chain – Simple moving average, weighted moving average, exponential smoothening method, Supply Chain efficiency, Core and reverse Supply Chain, International Supply Chain, Aggregate planning, inbound and outbound SCM, bullwhip effect in SCM.

Latest trend in Production and operation – Lean manufacturing, Agile manufacturing.

Unit-V 6 sessions)Productivity and Quality

TQM, Deming's 14principles, PDCA cycle - KAIZEN, Quality circles, 7QC tools, ISO 9000-2000 clauses, SixSigma, Total Productive Maintenance(TPM).

SUGGESTED READING:

1. MAHADEVAN: Operation management: Theory and Practice (PEARSON) (with MLSA)
2. Chary - Production and Operations Management (Tata McGraw-Hill, 1997, 9th Edition)
3. Bisen& Singh-Operation & Logistics Management (Excel Books)
4. R.V.Badi& N.V. Badi - Production & Operation Management (Vrinda Publications 3rd Edition)
5. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Ed.)
6. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
7. Adam Jr Everetl E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)

Expected Course Outcomes:

- Students will improve upon their conceptual skills, understanding and application of tools and techniques of operations management in business practices in real time.
- Students will develop understanding and application of factors in the design of effective operating systems.
- Students will understand the concept of TQM perspectives.
- Students will understand the concepts of Material Management and Supply Chain Management.

Quantitative Techniques for Managers

RMB207

<u>COURSE OBJECTIVES</u>

- Understand the importance of the use of OR application in decision Making environment
- To formulate LPP and Obtain Graphical Solutions & Acquire General idea of the Simplex method.
- To understand and solve transportation & assignment models.
- To know optimal sequence model and understand concepts of queuing theory.
- To identify right time for replacement of equipment and understand project management techniques

Unit I (6 Sessions)

Operations Research & Decision Making Environments Operations Research:- Uses, Scope and Applications of Operation Research in managerial decision-making .*Decision-making environments:-* Decision-making under certainty, uncertainty and risk situations; Decision tree approach and its applications.

Unit II (8 Sessions)

Linear Programming Problem & Transportation Problem *Linear programming*: Mathematical formulations of LP Models for product-mix problems; graphical and simplex method of solving LP problems; duality.

Transportation problem: Various methods of finding Initial basic feasible solution-North West Corner Method, Least Cost Method & VAM Method and optimal solution-Stepping Stone & MODI Method, Maximization Transportation Problem

Unit III (10 Sessions)

Assignment model & Game Theory *Assignment model*: Hungarian Algorithm and its applications, Maximization Assignment Problem.

Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point; Odds Method; Dominance Method and Graphical Method for solving Mixed Strategy Game.

Unit IV (10 Sessions)

Sequencing & Queuing Theory Sequencing Problem: Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m - Machines Problems.

Queuing Theory: Characteristics of M/M/I Queue model; Application of Poisson and Exponential distribution in estimating arrival rate and service rate; Applications of Queue model for better service to the customers.

Unit V (6 Sessions)

Replacement Problem & Project Management Replacement Problem: Replacement of assets that deteriorate with time, replacement of assets which fail suddenly.*Project*

Management: Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations.

TEXT BOOK

1. R. Panneerselvam - Operations Research (PHI, 2nd Edition)
2. Sharma J K - Operations Research (Pearson, 3rd Edition

REFRENCE BOOKS:

1) Apte-Operation Research and Quantitative Techniques (Excel Books)
2) S Kalawathy-Operation Research (Vikas IVth Edition)
3) Natarajan- Operation Research(Pearson)
4) Singh & Kumar—Operation Research(UDH Publisher edition 2013)
5) Taha Hamdy - Operations Research - An Introduction (Prentice-Hall, 9th edition)
6) Vohra - Quantitative Techniques in Management (Tata McGraw-Hill, 2nd)
7) Kothari - Quantitative Techniques (Vikas 1996, 3rd Edition).

Course Outcomes

- Be able to understand the characteristics of different types of decision-making environments and the appropriate decision making approaches and tools to be used in each type.
- To formulate linear programming problem and to find optimal solution by graphical simplex method
- Be able to build and solve Transportation Models and Assignment Models also to solve game theory problems by understanding pure and mix strategies.
- To assign optimal sequence of difference jobs on different machines and develop understanding of queuing theory concepts.
- To implement replacement of equipments at right time and able to implement project management concepts like CPM, PERT to reduce cost and time.

Employable Skills	**Measuring Tools**
Ability to identify and apply the knowledge of subject practically in real life situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

Legal Aspects of Business

RMB208

Course Objectives

1. To provide basic understanding of law of contract, Law of agency, Bailment & Pledge
2. To provide basic requirements of Negotiable Instruments Act, Law of Insurance and Law of Partnership for the purpose of conducting business
3. To impart basic provisions of Companies Act concerning incorporation and regulation of business organizations
4. To create an awareness about important legislations namely Sale of Goods Act, Consumer Protection Act, Factories Act having impact on business.
5. To appraise the students on the leading practical application oriented case studies – relevant and updated and analyzing case laws in arriving at conclusions facilitating business decisions.

Course Outcomes

Upon successfully completing the course, candidates should be able to:

1. Acquire a sound understanding of the legal aspects of the law affecting businesses
2. Explain the principles of Indian Business Law and Company Law
3. Develop reasoning abilities by applying the principles of law in the business environment
4. Appraise the legal environment of the organization and develop suitable strategies.
5. Analyse a given business context using basic understanding of the applicable Acts and develop a suitable operational framework.

Course Credits	**3**
Contact Hours	**36 Hrs**

Unit- 1 (8 hrs)

Law of Contract: Definition, essentials and types of contracts, offer – definition and essentials, acceptance – definition and essentials, consideration – definition and essentials, exceptions to the rule, no consideration, no contract, doctrine of privity of contract, capacity of parties, free consent, quasi contract, legality of object, performance of contract, termination of contract, remedies for breach of contract. Law of Agency: Essentials, kinds of agents, rights and duties of agent and principal, creation of agency, termination of agency

Unit 2 (8 hrs)

Negotiable instruments act 1881, Nature and characteristics of Negotiable instruments, kinds of negotiable instruments – promissory notes, bills of exchange and cheques. Parties to negotiable instruments, Negotiation, presentment, discharge and dishonour of negotiable instruments

Law of partnership: Definition, essentials of partnership, formation of partnerships, kinds of partners, authorities, rights and liabilities of partners, registration of partnership, dissolution of partnership firm.

Unit 3 (7hrs)

Companies Act: definition, characteristics and kinds of companies, steps in formation of company. Memorandum of association, articles of association, prospectus.
Directors: appointment, power, duties and liabilities, meeting and resolutions: types of meetings. Auditor: appointment, rights and liabilities. modes of winding up of a company.

Unit 4 (6 hrs)

Sale of goods Act: Essentials, sale v/s agreement to sell. Condition v/s warranties, rights of unpaid seller.
Consumer Protection Act: Objectives, definition, consumer protection council and state consumer protection council.

Unit 5 (7 hrs)

The Information Technology Act, 2000

Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of
Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying
Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.

The Right to Information Act, 2005

Right to know, Salient features of the Act, obligation of public Authority, Designation of Public Information officer, Request for obtaining information, Duties of a PIO, Exemption from disclosure of information, Partial disclosure of information, In formation commissions, powers of Information Commissions, Appellate Authorities, Penalties, Jurisdiction of courts.

Suggested Readings

1. Kuchhal M.C. - Business Law (Vikas Publication)
2. Gulshan S.S. - Business Law Including Company Law (Excel Books)
3. N D Kapoor – Elements of Mercantile Law – Sultan Chand-2014
4. Dr Avatar Singh- Principles of Mercantile Law, Eastern Book Company 2014
5. Nandan Kamath- Law relating to Computer, Internet and E-Commerce (A Guide to cyber Laws), Universal Law Publishing Co. Ltd. New Delhi, 2012.
6. Relevant Acts

EMPLOYABLE SKILLS

Skill	Measurement tool
Understanding of fundamentals of the legal aspects of the law affecting businesses.	Presentations, Quiz
Understanding of principles of Indian Business Law and Company Law.	Group assignment, Case study analysis
Develop reasoning abilities for applying law principles.	Group assignment, Case study analysis
Develop a suitable legal operational framework.	Quiz, Debate, Case study analysis

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

for

B.Tech. First Year

(Civil/Computer/Chemical/Electrical/Electronics/Mechanical/Textile/Carpet/)

On

Choice Based Credit System

(Effective from the Session: 2016-17)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. TECH. FIRST SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS103	Engineering Maths-I	3---1---0	70	20	10	100	4
2	RAS101	Engineering Physicss-I	3---1---0	70	20	10	100	4
3	REE101/ RME101	Basic Electrical Engg/ Elements of Mechanical Engg	3---1---0	70	20	10	100	4
4	RAS 104/ RCS101	Professional Communication/ Computer System & Programming in	3---0---0	70	20	10	100	3
5	REC101/ RAS102	Basic Electronics/ Engineering Chemistry	3---1---0	70	20	10	100	4
6	RAS151/ RAS152	Engg. Physics Lab/ Engg. Chemistry Lab	0---0---2	50		50	100	1
7	REE151/ RME151	Basic Electrical Engg Lab/ Elements of Mechanical Engg Lab	0---0---2	50		50	100	1
8	RAS 154/ RCS151	Professional Communication Lab/ Computer Progm. Lab	0---0---2	50		50	100	1
9	RME152/ RCE151	Workshop Practice/ Computer Aided Engg. Graphics	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

B. TECH. SECOND SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					Test	Assig/Att.		
1	RAS203	Engineering Maths-II	3---1---0	70	20	10	100	4
2	RAS201	Engineering Physicss-II	3---1---0	70	20	10	100	4
3	RME201/ REE201	Elements of Mechanical Engg/ Basic Electrical Engg	3---1---0	70	20	10	100	4
4	RCS201/ RAS 204	Computer System & Programming in C/ Professional Communication	3---0---0	70	20	10	100	3
5	RAS202/ REC201	Engineering Chemistry/ Basic Electronics	3---1---0	70	20	10	100	4
6	RAS252/ RAS251	Engg. Chemistry Lab/ Engg. Physics Lab	0---0---2	50		50	100	1
7	RME251/ REE251	Elements of Mechanical Engg Lab/ Basic Electrical Engg Lab	0---0---2	50		50	100	1
8	RCS251/ RAS 254	Computer Progm. Lab/ Professional Communication Lab	0---0---2	50		50	100	1
9	RCE251/ RME252	Computer Aided Engg. Graphics/ Workshop Practice	0---0---3	50		50	100	2
	TOTAL						**900**	**24**

RAS103

Engineering Mathematics - I

L	T	P
3	1	0

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit , Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extrema of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stoke's and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics,John-Wiley & Sons
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Thomas & Finley, Calculus, Narosa Publishing House
4. Rukmangadachari, Engineering Mathematics – I, Pearson Education.

A.C.Srivastava & P.K.Srivastava, Engineering Mathematics, Vol.I, PHI Learning Pvt. Limited, New Delh

RAS101

ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics **08 Hrs.**

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics **10 Hrs.**

Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics **10 Hrs.**

Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser **08 Hrs.**

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography **06 Hrs.**

Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics - Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Optics - Brijlal & Subramanian (S. Chand)
5. Engineering Physics- C. Mani Naidu(Pearson)
6. Lasers Principles, Types and Applications- K R Nambiar (New Age)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New

RAS-151/RAS-251

ENGINEERING PHYSICS LAB

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List of Experiments
Any ten experiments, at least four from each group.

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinalpoints.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He- Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

RAS102/ RAS202

ENGINEERING CHEMISTRY

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Unit	Content	Hours
Unit-1	Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications	**8**
Unit-2	Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradablepolymers. Preparations and applications of some industrially important polymers(Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6 , Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.	**8**
Unit-3	Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..	**8**
Unit-4	Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.	**8**
Unit-5	Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H^1NMR spectral Techniques.	**8**

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education
9. Physical Chemistry by Gordon M. Barrow; Mc-Graw Hill
10. Organic Chemistry, Volume 1(6 ed)& 2 (5ed) by I. L. Finar; Pearson Education
11. Atkins' Physical Chemistry by Peter Atkins & Julio De Paula; Oxford University Press

RAS 152/ RAS 252

ENGINEERING CHEMISTRY PRACTICALS

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA ..
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

REC101 / REC201

BASIC ELECTRONICS

Unit	Topics	Lectures
I	PN junction diode**: Introduction of Semiconductor Materials** Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices **:**Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.	12
II	Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration.Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (r_e Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,	10
III	Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator). **OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current** Differential and Common-Mode Operation	6
IV	Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Multimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, **Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.**	6
V	Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, **Introduction of various analog modulation techniques**, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.	6

Text Books:

1. Robert L. Boylestand / Louis Nashelsky *"Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication,.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH,

Reference Books:

1. David A. Bell, "*Electronic Devices and Circuits",* Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, Staya brataJit, "*Electronic Devices and Circuits*", Latest Edition , TMH.
3. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

RME-101/RME-201: ELEMENTS OF MECHANICAL ENGINEERING **L T P: 3-1-0**

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroidand Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

9

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

8

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

8

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its' measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

8

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and it's corollaries.Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine , difference between SI and CI engines. P-v and T-s diagramsof Otto and Diesel cycles, comparison of efficiency.

9

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam , Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Thimoshenko& Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K.Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel& Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub .
9. An Introduction to Mechanical Engineering by Wickert& Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson
14. Basic Mechanical Engineering by Agrawal&Agrawal, Wiley
15. Elements of Mechanical Engineering by Singh, Anne Books Pvt Ltd
16. Elements of Workshop Technology by Hajra Choudhary Media Promoter

RME-151/RME-251: ELEMENTS OF MECHANICAL ENGINEERING LAB **LTP: 0-0-0-2**

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduce friction experiment on screw-jack.

REE 101/REE201

BASIC ELECTRICAL ENGINEERING

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3 1 0

COURSE OUTCOMES

1. Solve and analyze the DC & AC electrical circuits using KVL/KCL and network theorems.
2. Solve and analyze the behavior of AC electrical circuits and resonance.
3. Apply the concepts of measurements in measuring electrical quantities.
4. Solve and analyze the behavior of magnetic circuits and demonstrate the working of single phase transformers, auto-transformer and their applications.
5. Demonstrate the working principles of basic electrical machines including DC as well as AC machines and identify the type of electrical machine used for a particular application.

DETAILED SYLLABUS

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLCCircuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit: Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1 .“Basic Electrical Engineering”, S N Singh; Prentice Hall International

2. “Basic Electrical Engineering”, Kuldeep Sahay, New Age International Publishers

3.“Fundamentals of Electrical Engineering”, B Dwivedi, A Tripathi; Wiley India

4.“Principles of Electrical Engineering”, V. Del Toro,; Prentice Hall International

5. “Electrical Engineering”, J. B. Gupta, Kataria and Sons

Reference Books:

1.“Electrical and Electronics Technology”, Edward Hughes; Pearson

2.“Engineering Circuit Analysis”, W.H. Hayt& J.E. Kimerly; Mc Graw Hill

3.“Basic Electrical Engineering”, C L Wadhwa; New Age International

4.“Basic Electrical Engineering”, T.K. Nagsarkar,M.S. Shukhija; Oxford University Press

REE 151/REE251

ELECTRICAL ENGINEERING LABORATORY

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0 0 2

COURSE OUTCOMES

At the end of the course, the student should be able

- Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
- Demonstrate the working of various measuring instruments like ammeter, voltmeter, wattmeter, energy meter etc.
- Conduct experiments illustrating the working of magnetic circuits, single phase transformers and auto-transformers.
- Conduct experiments illustrating the behavior of DC and AC machines and identify the type of electric machine used for a particular application.

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verfication of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

RCS101/RCS201

Computer System and Programming in C

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3 0 0

Unit1: (10 Lectures)

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.
Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types.
Number system: Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.
Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2: (8 Lectures)

Standard I/O in "C", **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associatively.
Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3: (10 Lectures)

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.
Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4: (6 Lectures)

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays.Structure, union, enumerated data types

Unit 5: (8 Lectures)

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication .

5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

RCS151/RCS251

Computer Programming Lab

1.WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained bythe student.
2.WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate ofInterest and Time are entered through the keyboard.
3.WAP to calculate the area and circumference of a circle.
4.WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5.WAP that swaps values of two variables using a third variable.
6.WAP that checks whether the two numbers entered by the user are equal or not.
7.WAP to find the greatest of three numbers.
8.WAP that finds whether a given number is even or odd.
9.WAP that tells whether a given year is a leap year or not.
10.WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%--------------Print ‘A’
80-90%----------------------------Print ‘B’
60-80%---------------------------Print ‘C’
Below 60%----------------------Print ‘D’
11.WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12.WAP to print the sum of all numbers up to a given number.
13.WAP to find the factorial of a given number.
14.WAP to print sum of even and odd numbers from 1 to N numbers.
15.WAP to print the Fibonacci series.
16.WAP to check whether the entered number is prime or not.
17.WAP to find the sum of digits of the entered number.
18.WAP to find the reverse of a number.
19.WAP to print Armstrong numbers from 1 to 100.
20.WAP to convert binary number into decimal number and vice versa.
21.WAP that simply takes elements of the array from the user and finds the sum of these elements.
22.WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23.WAP to find the minimum and maximum element of the array.

24.WAP to search an element in a array using Linear Search.
25.WAP to sort the elements of the array inascending order using Bubble Sort technique.
26.WAP to add and multiply two matrices of order nxn.
27.WAP that finds the sum of diagonal elements of a mxn matrix.
28.WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
23
29.Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time : aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute. Maintain a train
timetable and implement the following operations:
(i)List all the trains (sorted according to train number) that depart from a particular section.
(ii)List all the trains that depart from a particular station at a particular time.
(iii)List all he trains that depart from a particular station within the next one hour of a given time.
(iv)List all the trains between a pair of start station and end station.
30. WAP to swap two elements using the concept of pointers.
31.WAP to compare the contents of two files and determine whether they are same or not.
32.WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

RAS104/RAS204

Professional Communication

S.No.	Unit	Contents
1	**Unit-1 Fundamentals of Communications**	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
2	**Unit-II Written Communication**	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods-Inductive, Deductive, Spatial , Linear, Chronological etc.
3	**Unit-III Business Communication**	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
4	**Unit-IV Presentation Strategies and Soft Skills.**	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
5	**Unit –V Value- Based Text Readings**	Following essays from the prescribed text book with emphasis on Mechanics of writing. **(i)** Humanistic and Scientific Approaches to Human Activity by Moody E. Prior **(ii)** The Language of Literature and Science by A. Huxley **(iii)** Man and Nature by J. Bronowski **(iv)** Science and Survival by Barry Commoner **(v)** The Mother of the Sciences by A.J. Bahm.
6	**Text Book**	1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi. 2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi. 3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.
7	**Reference Books**	1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi. 2. Business Correspondence and Report Writing by Prof. R.C.,Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi. 3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

		4. Developing Communication skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi. 5. Manual of Practical Communication by L.U.B. Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi. 6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi. 7. Spoken English- A manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison Orient Blackswan, 2013, New Delhi.

RAS154/RAS254

PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICALS

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Pressentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

RME-152/RME-252: WORKSHOP PRACTICE **L T P: 0 0 3**

1. Carpentry Shop:

(a) Study of tools & operations and carpentry joints.
(b) Simple exercise usingjack plane.
(c) To prepare half-lap corner joint, mortise &tennon joints.
(d) Simple exercise onwoodworking lathe.

2. Fitting (Bench Working) Shop:

(a) Study of tools & operations
(b) Simple exercises involving fitting work.
(c) Make perfect malefemalejoint.
(d) Simple exercises involving drilling/tapping/dieing.

3. Black Smithy Shop:

(a) Study of tools & operations
(b) Simple exercises based on black smithyoperations such as upsetting, drawing down, punching, bending, fullering& swaging.

4. Welding Shop:

(a) Study of tools & operations of Gas welding & Arc welding
(b) Simple butt andLap welded joints.
(c) Oxy-acetylene flame cutting.

5. Sheet-metal Shop:

(a) Study of tools & operations.
(b) Making Funnel complete with 'soldering'.
(c) Fabrication of tool-box, tray, electric panel box etc.

6. Machine Shop:

(a) Study of Single point cutting tool, machine tools and operations.
(b) Planeturning.
(c) Step turning
(d) Taper turning.
(e) Threading

7. Foundry Shop:

(a) Study of tools & operations
(b) Pattern making.
(c) Mould making with the use ofa core.
(d) Casting

RCE151/RCE251

Computer Aided Engineering Graphics

L T P
0 0 3

Introduction
Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning line conventions and free hand practicing, AUTO CAD, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines,Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints.
2 – Sheets Orthographic Projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes
2 – Sheets Orthographic Projections of Plane Surfaces (First Angle Projection Only)
Introduction, Definitions–projections of plane surfaces–triangle, square, re
ctangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only.
1 – Sheet Projections of Solids (First Angle Projection Only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions.
2-Sheets Sections And Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP.
1 – Sheet Isometric Projection (Using Isometric Scale Only)
Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms
, pyramids, cylinders, cones, spheres, cut spheres.
1-Sheet

Text Books
1. Engineering Drawing - N.D. Bhatt & V.M. Panchal, 48thedition, 2005-Charotar Publishing House, Gujarat.
2. Computer Aided Engineering Drawing - S. Trymbaka Murthy, -I.K International Publishing House Pvt. Ltd., New Delhi, 3rdrevised edition- 2006.

Reference Books
1. Engineering Graphics - K.R. Gopalakrishna, 32nd edition, 2005- Subash Publishers Bangalore.
2. Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production-Luzadder Warren J., Duff John M., Eastern Economy Edition, 2005- Prentice-Hall of India Pvt. Ltd., New Delhi.
Engineering Drawing – M.B. Shah, B.C.Rana, 2nd Edition,2

RAS203

Engineering Mathematics - II

L	T	P
3	1	0

Unit - 1: Ordinary Differential Equations

Linear differential equations of n^{th} order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw- Hill Publishing Company Ltd.
3. R.K.Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. – II, PHI Learning Pvt. Ltd.
5. Rukmangadachari, Engineering Mathematics – II, Pearson Education.

RAS-201

ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction **10Hrs.**

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials **10Hrs.**

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Claussius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory **06 Hrs.**

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids **06 Hrs.**

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials **08Hrs.**

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations, Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)

5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New Delhi)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

MBA

AS PER AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

MBA 1st Year Course Structure in accordance with AICTE Model Curriculum
Effective w.e.f. Academic Session 2018

SEMESTER - I

S. No	CODE	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	KMB 101	MANAGEMENT CONCEPT & INDIAN ETHOS	4	0	0	30	20	50	0	100	0	150	3
2	KMB102	MANAGERIAL ECONOMICS	4	0	0	30	20	50	0	100	0	150	3
3	KMB103	FINANCIAL ACCOUNTING FOR MANAGERS	4	0	0	30	20	50	0	100	0	150	3
4	KMB104	BUSINESS STATISTICS AND ANALYSIS	4	0	0	30	20	50	0	100	0	150	3
5	KMB105	ORGANISATIONAL BEHAVIOUR	4	0	0	30	20	50	0	100	0	150	3
6	KMB106	MARKETING MANAGEMENT - I	4	0	0	30	20	50	0	100	0	150	3
7	KMB107	BUSINESS COMMUNICATION	4	0	0	30	20	50	0	100	0	150	3
8	KMB108	COMPUTER APPLICATION IN MANAGEMENT	3	0	1	30	20	50	0	100	0	150	3
9	NON CREDIT	DEVELOPING SOFT SKILLS & PERSONALITY	2	0	0							0	0
		TOTAL										**1200**	**24**

SEMESTER - II

S. No	CODE	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	KMB 201	BUSINESS ENVIRONMENT	4	0	0	30	20	50	0	100	0	150	3
2	KMB202	HUMAN RESOURCE MANAGEMENT	4	0	0	30	20	50	0	100	0	150	3
3	KMB203	BUSINESS RESEARCH METHODS	4	0	0	30	20	50	0	100	0	150	3
4	KMB204	FINANCIAL MANAGEMENT & CORPORATE FINANCE	4	0	0	30	20	50	0	100	0	150	3
5	KMB205	OPERATIONS MANAGEMENT	4	0	0	30	20	50	0	100	0	150	3
6	KMB206	QUANTITATIVE TECHNIQUES FOR MANAGERS	4	0	0	30	20	50	0	100	0	150	3
7	KMB207	LEGAL ASPECTS OF BUSINESS	4	0	0	30	20	50	0	100	0	150	3
8	KMB208	MARKETING MANAGEMENT – II	4	0	0	30	20	50	0	100	0	150	3
9	KMB209	COMPREHENSIVE VIVA	0	0	0					100	0	100	3
10	NON CREDIT	DEVELOPING SOFT SKILLS & PERSONALITY	2	0	0							0	0
		TOTAL										1300	27

MANAGEMENT CONCEPTS AND INDIAN ETHOS
KMB101

Course Objectives:

1. The purpose of this course is to expose the student to the basic concepts of management in order to aid the student in understanding how an organization functions, and in understanding the complexity and wide variety of issues managers face in today's business firms.
2. Discuss the various concepts of planning, Decision making and controlling to help solving managerial problems
3. Study and understand management concepts and styles in Global context.
4. Familiarizing the students with the contemporary issues in management.

Course Credit: 3 **Contact Hours: 36 hours**

UNIT-I

Role of Indian Ethos in managerial practice , Management lessons from Vedas, Mahabharata, Kautaliya'sArthashtra, Ethics Vs Ethos , Indian Vs western Management Contemporary issues in Management. (7 Hours)

UNIT-II

Management practices from past to present, Different levels of management, Managerial skills, Roles& Functions, Manager and Business environment. (7 Hours)

UNIT – III

Planning- Objective of planning, planning process, Types of planning, Types of plans, Corporate planning, Management by Objective, Decision-making- types, process & techniques, making decision effective. (7 hours)

UNIT-IV

Organising& staffing- Meaning of organization, types of organization, Organization structure, Span of management, Line and staff relationship, Departmentation, Delegation- Centralization and decentralization of authority, Meaning of staffing, Recruitment, selection & placement, Training & development. (8 Hours)

UNIT- V

Directing & Controlling- Principle of directing, Essence of coordination, Basic control process, Different control techniques, Management by exception. (7 Hours)

Course Outcomes: After completing the course student will be able to understand and explain

Course Outcomes	Bloom's taxonomy
CO 1: Developing understanding of managerial practices and their perspectives.	• **Knowledge (K 2)** • **Remembering (K1)**
CO2: Applying planning and managerial decision making skills.	• **Applying (K 4)**
CO 3: Develop analytical and problem solving skills, based on understanding of management concepts and theories.	• **Analyzing (K 5)**
CO 4: Comprehend and practice Indian Ethos and Value Systems.	• **Comprehending (K 3)**
CO 5: Applying value based management and ethical practices.	• **Applying (K4)**

Employable Skills	**Measuring Tools**
Ability to identify and apply the knowledge of subject practically in real life situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

Reference Books:

1. Koontz Harold &Weihrich Heinz – Essentials of management (Tata McGraw Hill, 5th Edition,2008)

2. Dr. Premvir Kapoor, Principles and Practices of Management, Khanna Publishing House, Delhi

2. Robbins & Coulter - Management (Prentice Hall of India, 9th Edition)

3. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential.Concepts and Applications Pearson Education, 6th Edition.

4. Weihrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective.

5. James F.Stoner,et al, Management, Pearson Education Delhi, 2008

6. Principles of Management, George R. Terry & S.G. Franklin, AITBS, Delhi.

Text Books:

1. L. M. Prasad- Principles and Practices of Management, Sulatn Chand & Sons, 7th edition, 2007.
2. N M Khandelwal- Indian Ethos & Values for Management- Himalyan Publishing

MANAGERIAL ECONOMICS
KMB102

Course Objective:

- Understand the relative importance of Managerial Economics
- Know how the application of the principles of managerial economics can aid in achievement of business objectives
- Understand the modern managerial decision rules and optimization techniques.
- Be equipped with the tools necessary in analysis of consumer behavior as well as in forecasting product demand
- Understand and be able to apply latest pricing strategies
- Understand and analyse the macro environment affecting the business decision making.

Course Credit: 4 **Contact Hours: 40 hours**

UNIT –I

(6 Hrs)

Basic Concepts and principles:
Definition, Nature and Scope of Economics-Micro Economics and Macro Economics, Managerial Economics and its relevance in business decisions.Fundamental Principles of Managerial Economics - Incremental Principle, Marginal Principle, Opport**UNIT**y Cost Principle, Discounting Principle, Concept of Time Perspective, Equi-Marginal Principle, Utility Analysis, Cardinal Utility and Ordinal Utility.

UNIT –II

(8Hrs)

Demand and Supply Analysis :
Theory of Demand, Types of Demand. Determinants of demand , Demand Function ,Demand Schedule , Demand curve , Law of Demand, Exceptions to the law of Demand , Shifts in demand curve , Elasticity of Demand and its measurement. Price Elasticity, Income Elasticity, Arc Elasticity. Cross Elasticity and Advertising Elasticity. Uses of Elasticity of Demand for managerial decision making , Demand forecasting meaning, significance and methods.(numerical Exercises)
Supply Analysis; Law of Supply, Supply Elasticity; Analysis and its uses for managerial decision making.
Price of a Product under demand and supply forces

UNIT –III (10Hrs)

Production and cost Analysis:
Production concepts & analysis; Production function, Types of production function, Laws of production : Law of diminishing returns , Law of returns to scale.
Cost concept and analysis: Cost, Types of costs, Cost output relationship in the short-run. Cost output relationship in the Long-run.

Estimation of Revenue. Average Revenue, Marginal Revenue

UNIT –IV

(10Hrs)

Market structures:
Perfect and Imperfect Market Structures , Perfect Competition, features, determination of price under perfect competition. Monopoly: Feature, pricing under monopoly, Price Discrimination. Monopolistic: Features, pricing under monopolistic competition, productdifferentiation. Oligopoly: Features, kinked demand curve, cartels, price leadership.

UNIT –V (6Hrs)

National Income; Concepts and various methods of its measurement, Circular flows in 2 sector, 3 sector, 4 sector economies, Inflation, types and causes, Business Cycle & its phases.

Employable Skills Measuring tool

Ability to forecast demand Exercise + Workshop
Ability to analyse various market structures Exercise + Workshop
Ability to appreciate the role of various
monetary policy tools in controlling inflation Exercise + Workshop

Course Outcomes:

Course Outcomes	Bloom's taxonomy
CO1: Students will be able to remember the concepts of micro economics and also able to understand the various micro economic principles to make effective economic decisions under conditions of risk and uncertainty.	• **Knowledge (K 2)** • **Remembering (k1)**
CO2: The stdents would be able able to understand the law of demand & supply & their elasticities , evaluate &analyse these concepts and apply them in various changing situations in industry . Students would be able to apply various techniques to forecast demand for better utilization of resources.	• **Knowledge (K 2)** • **Applying (K 4)** • **Synthesizing (K6)** • **Evaluating (K7)**
CO3: The students would be able to understand the production concept and how the production output changes with the change in inputs and able to analyse the effect of cost to business and their relation to analyze the volatility in	• **Comprehending (K 3)** • **Applying (K 4)** • **Analyzing (K 5)** • **Evaluating (K7)**

the business world	
CO4: The students would be able to understand & evaluate the different market structure and their different equilibriums for industry as well as for consumers for the survival in the industry by the application of various pricing strategic	• **Applying (K 4)** • **Analyzing (K 5)** • **Synthesizing (K6)**
CO5: The students would be able to analyse themacroeconomic concepts & their relation to micro economic concept & how they affect the business & economy.	• **Knowledge (K 2)** • **Comprehending (K 3)**

Text Books:

1. Managerial Economics, GEETIKA, McGraw-Hill Education 2nd Ed.
2. Managerial Economics: Concepts and Applications (SIE), THOMAS& MAURICE, McGraw-Hill Education, 9th Ed
3. Managerial Economics, H.L Ahuja, S.Chand, 8th Ed
4. Managerial Economics ,D.N.Dwivedi,Vikas Publication, 7th Ed
5. Managerial Economics – Theory and Applications, Dr.D.M.Mithani, Himalaya Publications, 7th Ed.
6. Sociology & Economics for Engineers, Dr. Premvir Kapoor, Khanna Publishing House

Financial Accounting for Managers
KMB 103

Course Objectives: This course is intended to introduce the basic theory, concepts and practice of financial accounting and to enable students to understand information contained in the published financial statements of companies and other organizations. It includes the preparation of accounting statements, but their uses and limitations will also be emphasized.

Course Credit: 4 **Contact Hours: 40 hours**

UNIT I (6Hrs)

Meaning and Scope of Accounting : Overview of Accounting, Users of Accounting, Accounting Concepts Conventions, Book keeping and Accounting, Principles of Accounting, Basic Accounting terminologies, Accounting Equation , Overview to Deprecation (straight line and diminishing method) .

UNIT II(6Hrs)

Accounting Standards and IFRS: International Accounting Principles and Standards; Matching of Indian Accounting Standards with International Accounting Standards, Human Resource Accounting, Forensic Accounting.

UNIT III (10 Hrs)

Mechanics of Accounting : Double entry system of Accounting, Journalizing of transactions; Ledger posting and Trial Balance ,Preparation of final accounts, Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Excel Application to make Balance sheet, Case studies and Workshops.

UNIT IV (10 Hrs)

Analysis of financial statement: Ratio Analysis- solvency ratios, Profitability ratios, activity ratios, liquidity ratios, Market capitalization ratios; Common Size Statement; Comparative Balance Sheet and Trend Analysis of manufacturing, Service & banking organizations, Case Study and Workshops in analyzing Balance sheet.

UNIT V (8 Hrs)

Concepts of Working Capital and its types, Determinants of Working Capital, methods of calculating Working Capital, Working Capital Financing. Cash Flow Statement: Various cash and non-cash transactions, flow of cash, difference between cash flow and fund flow, preparation of Cash Flow Statement and its analysis.

Course Outcome:

After successful completion of this course students will be able to

S.No	Course Outcome	Bloom's taxonomy
1.	**CO1.** Understand and apply accounting concepts, principles and conventionsfor their routine monetary transaction;	Knowledge (K2)/ Comprehending (K 3)
2.	**CO2.** Recognize circumstances providing for increased exposure to fraud and define preventative internal control measures.	Knowledge (K2)
3.	**CO3.** Create and Prepare financial statements in accordance with Generally Accepted Accounting Principles	Synthesizing (K6)/ Remembering (k1)
4.	**CO4.** Utilize the technology (such as computers, information databases) in facilitating and enhancing accounting and financial reporting processes	Applying (K 4)
5.	**CO5.** Analyze, interpret and communicate the information contained in basic financial statements and explain the limitations of such statements.	Analyzing (K 4) / Evaluating (K7))
6.	**CO_6** Understandthe basic concepts and importance of working capital management	Remembering (k1)

SUGGESTED READINGS :

Text Books :

1) Maheshwari S.N &Maheshwari S K – A text book of Accounting for Management (Vikas, 10th Edition)
2) Essentials of Financial Accounting (based on IFRS), Bhattacharya (PHI,3rd Ed)
3) Khan and Jain - Financial Management (Tata McGraw Hill, 7th Ed.)
4) PC Tulsian- Financial Accounting (Pearson, 2016)
5) Dhamija - Financial Accounting for managers: (Prentice Hall, 2nd Edition).

Reference Books

1) Narayanswami - Financial Accounting: A Managerial Perspective (PHI,5th Ed)
2) DhaneshkKhatri- Financial Accounting (TMH,2015)
3) Ambrish Gupta - Financial Accounting: A Managerial Perspective (Prentice Hall, 4th Edition)
4) Ramchandran&Kakani - Financial Accounting for Management (TMH, 2nd Edition).
5) Mukherjee - Financial Accounting for Management (TMH, 2nd Edition).

BUSINESS STATISTICS & ANALYTICS
KMB104

COURSE OBJECTIVES

1. Understand the different basic concept / fundamentals of business statistics.
2. Understand the practical application of various concepts.
3.Understand the importance of measures of Descriptive statistics which includes measures of central tendency, Measures of Dispersion, Time Series Analysis, Index Number, Correlation and Regression analysis and their implication on Business performance.
4. Understand the concept of Probability and its usage in various business applications.
5. Understanding Decision making environment and applying the Concept of Business Analytics.

Course Credit: 4 **Contact Hours: 40 hours**

UNIT I (10 Sessions): Descriptive Statistics

Meaning, Scope, functions and limitations of statistics, Measures of Central tendency – Mean, Median, Mode, Quartiles, Measures of Dispersion – Range, Inter quartile range, Mean deviation, Standard deviation, Variance, Coefficient of Variation, Skewness and Kurtosis.

UNIT II (8 Sessions): Time Series & Index Number

Time series analysis: Concept, Additive and Multiplicative models, Components of time series, Trend analysis: Least Square method - Linear and Non- Linear equations, Applications in business decision-making.
Index Numbers:- Meaning , Types of index numbers, uses of index numbers, Construction of Price, Quantity and Volume indices:- Fixed base and Chain base methods.

UNIT III (6 Sessions): Correlation & Regression Analysis

Correlation Analysis: Rank Method & Karl Pearson's Coefficient of Correlation and Properties of Correlation.
Regression Analysis: Fitting of a Regression Line and Interpretation of Results, Properties of Regression Coefficients and Relationship between Regression and Correlation.

UNIT IV (8 Sessions): Probability Theory& Distribution

***Probability*:** Theory of Probability, Addition and Multiplication Law, Baye’s Theorem
***Probability Theoretical Distributions*:** Concept and application of Binomial; Poisson and Normal distributions.

UNIT V (8 Sessions)*Decision-making environments*

Decision-making under certainty, uncertainty and risk situations; Decision tree approach and its applications.

Concept of Business Analytics- Meaning, types and application of Business Analytics.
<u>COURSE OUTCOME :</u>After the completion of the course the students will be able to:

Course Outcome	Blooms Taxonomy
CO1. Gaining Knowledge of basic concept / fundamentals of business statistics.	• Knowledge (K 2)
CO2. To develop practical understanding of various statistics concepts.	• Remembering (K1) • Applying (K 4)
CO3. To compute various measures of central tendency, Measures of Dispersion, Time Series Analysis, Index Number, Correlation and Regression analysis and their implication on Business performance.	• Comprehending (K 3) • Applying (K 4)
CO4. Evaluating basic concepts of probability and perform probability theoretical distributions.	• Analyzing (K 5) • Synthesizing (K6)
CO5. Taking managerial decision and applying the Concept of Business Analytics.	• Evaluating (K7) • Applying (K 4)

Text Book

1. G C Beri – Business Statistics, 3rd ed, TATA McGrawHill.
2. Manish Sharma & Amit Gupta, The Practice of Business Statistics, Khanna Publishing House, Delhi
3. Chandrasekaran&Umaparvathi-Statistics for Managers, 1st edition, PHI Learning

Reference Book

1. Davis,Pecar – Business Statistics using Excel, Oxford
2. Ken Black – Business Statistics, 5th ed., Wiley India
3. Levin and Rubin – statistics for Management, 7th ed., Pearson
4. Lind, Marchal, Wathen – Staistical techniques in business and economics, 13th ed, McGrawHill
5. Newbold, Carlson, Thorne – Statistics for Business and Economics, 6th ed., Pearson
6. J.K. Tyagi, Business Statistics, Khanna Publishing House, Delhi.
6. S. C.Gupta – Fundamentals of Statistics, Himalaya Publishing
7. Walpole – Probability and Statistics for Scientists and Engineers, 8th ed., Pearson

ORGANIZATIONAL BEHAVIOR
KMB105

Course Objectives:

1. To enhance the understanding of the dynamics of interactions between individual and the organization.
2. To facilitate a clear perspective to diagnose and effectively handle human behavior issues in Organizations.
3. To develop greater insight into their own behavior in interpersonal and group, team, situations.

Course Credit: 3 **Contact hours: 36hrs**

UNIT I: (8 Hours)

Introduction to OB: The meaning of OB, Why study organizational behaviour, Fundamentals of individual behaviour. Determinants of Personality, types of personality, Personal effectiveness. Attitudes: Meaning, Types, Components, Theory of attitude formation and attitude change.

UNIT II: (8 Hours)

Foundation of Group Behaviour: Group: Meaning, types, group dynamics, group cohesiveness, Meaning of Interpersonal Behaviour& Interpersonal skills, Transactional Analysis, Johari Window, FIRO – B, MBTI

UNIT III: (8 Hours)

Motivation: Meaning & definition, Traditional theory of Motivation: Maslow's, Herzberg's, McClelland, Contemporary theories of Motivation: Self Determination Theory, Self Efficacy Theory, Vroom's Expectancy Theory, Equity Theory, Reinforcement Theory, OB MOD.

Perception: Meaning, process, principles and errors of perception, managerial &behavioural applications of perception.

UNIT IV: (8 Hours)

Leadership: What is leadership, types of leaders and leadership styles, traits and qualities of effective leader, trait theory, LSM – Leadership Situational Model, Team Building, Tuckman Model of Team Development.

UNIT V: (4 Hours)

Organizational Change: Meaning of organizational change, approaches to managing organizational change, creating a culture for change, implementing the change, Kurt Lewin Model of change.

Employable Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	Exercise Workshop Quiz Classroom Discussions

Course Outcomes: Upon the successful completion of this course, the student will be able to:

Course Outcomes	**Bloom's taxonomy**
CO 1: Comprehending the nature, functioning and design of organizations as social collectives	• **Comprehending (K3)** • **Knowledge (K 2)**
CO2: To evaluate the reciprocal relationship between the organizational characteristics and managerial behavior.	• **Analyzing (K 5)**
CO 3: Develop practical insights and problem solving capabilities for effectively managing the Organisational processes	• **Synthesizing (K6)**
CO 4: Analysing the behavior of individuals and groups in organizations.	• **Analyzing (K 5)**
CO 5: Developing conceptual understanding of change and its implementation.	• **Applying (K4)**

References:

Books:

1. Fred Luthans, "Organizational Behaviour", 12th Edition, McGraw Hill International Edition

2. Stephen P. Robbins, "Organizational Behaviour", 12th Edition, Prentice Hall

3. Aswathappa K, "Organizational Behaviour (Text, Cases and Games)", Himalaya Publication

4. UdaiPareek, "Organizational Behavior", Oxford University Press

MARKETING MANAGEMENT - I

KMB 106

COURSE OBJECTIVE

- To facilitate understanding of the conceptual framework of marketing and its applications in decision making under various environmental constraints.
- To develop understanding on Consumer and business buying behavior
- Develop skill to understand Segmentation, Targeting and Positioning and develop strategy
- Ability to Understand and implement the Marketing-Information Systems

Course Credit: 3 **Contact hours: 36 hrs**

COURSE CONTENTS

UNIT I

Marketing Management: Introduction, objectives, Scope and Importance. Types of Market, Core Concepts of Marketing, Functions of Marketing, Marketing Orientations

Marketing Environment: Introduction, Environmental Scanning, Techniques of Environment Scanning, Analyzing the Organization's Micro Environment, Company's Macro Environment, Differences between Micro and Macro Environment, Marketing Planning and Implementation (7hrs)

UNITII

Consumer buying behavior: Introduction, Characteristics, Factors affecting Consumer Behaiour, Types of Buying Decision Behaviour, Consumer Buying Decision Process, Buying Motives, Buyer Behaviour Models(7hrs)

UNITIII

Business Buyer Behaviour: Introduction, Characteristics of Business Markets, Differences between Consumer and Business Buyer Behaviour, Buying Situations in Industrial/Business Market, Buying Roles in Industrial Marketing, Factors that Influence Business Buyer, Steps in Business Buying Process (7hrs)

UNIT IV

Segmentation, Targeting and Positioning: Introduction, Concept of Market Segmentation, Benefits of Market Segmentation, Requisites of Effective Market Segmentation, The Process of Market Segmentation, Bases for Segmenting Consumer Markets, Targeting- Meaning, Target market strategies, Market Positioning- Meaning, Positioning Strategies, Value Proposition, Differentiation-Meaning, Strategies (8hrs)

UNITV Understanding the Marketing-Information Systems (MKIS): Introduction, Characteristics of MKIS, Benefits, Types, Components, Marketing Research (7 hrs)

Course Outcomes: Upon the successful completion of this course, the student will be able to:

S.No	Course Outcome	Bloom's taxonomy
1	**CO1.** Remember and Comprehend basic marketing concepts.	Remembering (k1) Knowledge (K 2)
2	**CO2.** Understand marketing Insights on application of basic marketing concepts.	Synthesizing (K6) Comprehending (K 3)
3	**CO3.** Able to Apply and develop Marketing Strategies and Plans	Applying (K 4)
4	**CO4.** Understand and Analyzing Business/ Consumer Markets .	Analyzing (K 5)
5	**CO5.** Develop skills and ability Identify & evaluate Market Segments and Targeting.	Evaluating (K7)

TEXT BOOKS:

1) Marketing Management: A South Asian Perspective - Kotler, Keller, Kevin 15/e, Pearson Education, 2016.

2) Marketing Management - Ramaswamy V. S. &Namakumar S, 5/e, McGrawHill Education Publishers, 2015.

3) Marketing Management - Tapan Panda, 5/e, Excel Publication, 2007.

REFERENCE BOOKS:

1) Managing Marketing, Noel Capon, SidharthShekar Singh, 4/e Wiley

2) Marketing: Lamb, Hair, McDanniel, Cengage Learning 2012.

Business Communication
KMB107

Course Objectives

1: To understand business communication strategies and principles for effective communication in domestic and international business situations.
2: To understand and appropriately apply modes of expression, i.e., descriptive, expositive, narrative, scientific, and self-expressive, in written, visual, and oral communication.
3: To develop the ability to research and write a documented paper and/or to give an oral presentation.
4 : To develop the ability to communicate via electronic mail, Internet, and other technologies for presenting business messages.
5: To understand and apply basic principles of critical thinking, problem solving, and technical proficiency in the development of exposition and argument.

Course Credits 3 **Hours 36 Hrs**

UNIT I : (8 hrs)

Introduction: Role of communication – defining and classifying communication – purpose of communication – process of communication –characteristics of successful communication – importance of communication in management – communication structure in organization – communication in crisis - barriers to communication.

UNITII: (7 hrs)

Oral communication: What is oral Communication – principles of successful oral communication – what is conversation control – reflection and empathy: two sides of effective oral communication – effective listening – non – verbal communication. Written communication: Purpose of writing – clarity in writing – principles of effective writing – approaching the writing process systematically: The 3X3 writing process for business communication: Pre writing – Writing – Revising – Specific writing features – coherence – electronic writing process.

UNITIII: (7 hrs)

Business letters and reports: Introduction to business letters – writing routine and persuasive letters – positive and negative messages- writing memos – what is a report purpose, kinds and objectives of report writing. Presentation skills: What is a presentation – elements of presentation – designing a presentation. Advanced visual support for business presentation types of visual aid

UNITIV: (7 hrs)
Employment communication: Introduction – writing CVs – Group discussions – interview skills Impact of Technological Advancement on Business Communication networks – Intranet – Internet – e mails – SMS – teleconferencing – video conferencing.

UNITV : (7 hrs)
Group communication: Meetings – Planning meetings – objectives – participants – timing – venue of meetings – leading meetings. Media management – the press release press conference – media interviews Seminars – workshop – conferences. Business etiquettes.

Course Outcomes
Upon successful completion of this course, the student should be able to:

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.	Applying (K4)
2	**CO2**. Analyse ethical, legal, cultural, and global issues affecting business Communication.	Analyse (K5)
3	**CO3**. Develop an understanding of appropriate organizational formats and channels used in business communications	Knowledge (K2)
4	**CO4.** Gaining an understanding of emerging electronic modes of communication.	Comprehending(K3)
5	**CO5.** Developing effective verbal and non verbal communication skills.	Remembering(K1)/ Applying (K4)

Suggested Readings:

1. Bovee&Thill – Business Communication Essentials A Skill – Based Approach to Vital Business English. Pearson.
2. Kulbhushan Kumar & R.S. Salaria, Effective Communication Skills, Khanna Publishing House, Delhi
3. Bisen&Priya – Business Communication (New Age International Publication)
4. Kalkar, Suryavanshi, Sengupta-Business Communication(Orient Blackswan)
5. Varinder Bhatia, Business Communications, Khanna Publishing House
5. Business Communication : Skill, Concepts And Applications – P D Chaturvedi, MukeshChaturvedi Pearson Education.
6. AshaKaul, Business Communication, Prentice Hall of India.

EMPLOYABLE SKILLS Skill	Measurement tool
Understanding of fundamentals of business communication strategies.	Presentations, Quiz

Apply suitable modes of expression.	Role Play followed by discussion
Compose accurate business documents	Group assignment/ Workshop/ Exercise.
Develop skills to use latest technology used for communication	Group project, presentations
Develop group communication skills.	Role play, Debate, Case study analysis

Computer Applications and Management Information System
KMB108

COURSE OBJECTIVES:

1. The course aims to provide knowledge about basic components of a computer and their significance.
2. To provide hands on learning of applications of MS Office and Internet in businesses.
3. To provide an orientation about the increasing role of management information system in managerial decision making to gain Competitive edge in all aspects of Business.
4. To understand various MIS operating in functional areas of an organization.
5. To create awareness in upcoming managers, of different types of information systems in an organization so as to enable the use of computer resources efficiently, for effective decision making.

Course Credits 3 **Hours 36 Hrs**

UNIT I (05 hours) Conceptual Framework

Hardware: (a) Input devices - keyboard, printing devices, voice speech devices, scanner, MICR, OMR, Bar code reader, digital camera etc. (b) Output devices - Visual Display **UNIT**, printers, plotters (c) Storage
Devices – Magnetic storage devices, Optical storage devices, Flash Memory.
Software: Types of software with examples; Introduction to languages, compiler, interpreter and Assembler, Operating System Functions, Types and Classification, Elements of GUI based operating system.

UNIT II (06 hours) Communication Technology

Network and Internet: Types of computer networks (LAN, WAN and MAN), Network topologies, EDI.
Internet: Netiquettes, Architecture & Functioning of Internet, Basic services over Internet like WWW, FTP, Telnet, Gopher, IP addresses, ISPs, URL, Domain names, Web Browsers, Internet Protocols, Search engines, e-mail.

UNIT III (12 hours) Office tools for Business

Use of MS-Office: Word: Paragraph formatting, Page formatting, Header and footer, Bullets and numbering, Finding and replacing text, Mail merge, Macros.
Cell referencing, Ranges.
Excel: Formulae, Functions, Auto sum, Copying formula, Formatting data, creating charts, creating Database, sorting data, filtering.

Power Point: Formatting text on slides, Inserting charts, adding tables, Clipping, Slide animation, Slide shows.

UNIT IV (7 hours) Information System Classification

Concept of Data and Information, Operations Support System (OSS), Management Support System(MSS), Transaction Processing System(TPS), Process Control System (PCS), Enterprise Collaboration System(ECS), Management Information System(MIS), Decision Support System (DSS), Executive Information System(EIS).
Artificial Intelligence (AI), Applications of Artificial Intelligence: Neural Networks, Fuzzy Logical Control System, Virtual Reality, Expert System (ES).

UNIT V (06 hours) Information Systems for Business

Applications: Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Security and Ethical Challenges Of IT, Business Ethics, Technology Ethics; Cyber Crime and Privacy Issues, Cyber Laws, IT Act 2000.

Course Outcomes
Upon successful completion of this course, the student should be able to:

S. No.	**Course Outcome**	**Bloom's Taxonomy**
1	**CO1.** Gain in depth knowledge of working of an IT enabled organisation	Knowledge (K2)
2	**CO2**. Learn to use various IT tools for solving Business Problems.	Applying (K4)
3	**CO3**. Develop and implement Information Systems for Business Applications.	Synthesizing (K6)
4	**CO4.** Learn to increase efficiency of various management processes by using IT enabled technology.	Applying (K4) Knowledge (K2)
5	**CO5.** Analyse various security and ethics related issues pertaining to the increasing use of Information Technology.	Analyse (K5)

Suggested Readings
1. Nasib Singh Gill – Handbook of Computer Fundamentals, Khanna Publishing House, Delhi
2. Shrivastava-Fundamental of Computer& Information Systems (Wiley Dreamtech)
3. Leon A and Leon M - Introduction to Computers (Vikas, 1st Edition).
4. R.S. Salaria, Computer Fundamentals, Khanna Publishing House, Delhi.

5. ITL ESL – Introduction to Information Technology (Pearson, 2nd Edition).
6 ITL ESL – Introduction to Computer science (Pearson, 2nd Edition).
7. Introduction to Computers, Norton P. (TATA McGraw Hill)
8. Leon - Fundamentals of Information Technology, (Vikas)
9. A. Ravichandran, Computers Today, Khanna Publishing House, Delhi.

Business Environment
KMB 201

Course Objectives:

- The basic objective of the course is to develop understanding and provide knowledge about business environment to the management students.
- To promote basic understanding on the concepts of Business Environment and to enable them to realize the impact of environment on Business.
- To provide knowledge about the Indian and international business environment.

Course Credit: 3 **Contact Hours:36Hrs**

UNITI Introduction- (8Hrs)

Business – Meaning, Definition, Nature & Scope, Objectives of Business: Economic &Social , Types of Business Organizations , Business Environment- Meaning, Characteristics, Scope and Significance, Components of Business Environment.
Introduction to Micro-Environment – Internal Environment: Value system, Mission, Objectives, Organizational Structure, Organizational Resources, Company Image, Brand Equity External Environment: Firm, customers, suppliers, distributors, Competitors, Society, Introduction to Macro Components – Demographic, Natural, Political, Social, Cultural Economic, Technological, International and Legal) Difference between macro and micro environment.

UNIT II Economic, Political and Legal environment (8Hrs)

Role of government in Business, Legal framework in India, Economic environment- economic system and economic policies. Concept of Capitalism, Socialism and Mixed Economy ,Impact of business on Private sector, Public sector and Joint sector , Competition Act and FEMA, Monetary and fiscal policies RBI-Role and functions, Regulations related to Capital Markets, Role of SEBI and working of stock Exchanges.

UNITIII (8Hrs)

A) Social and Cultural Environment – Nature, Impact of foreign culture on
Business, Traditional Values and its Impact, Social Audit and Social Responsibility of Business
B) Competitive Environment – Meaning, Michael Porter's Five Forces Analysis, Competitive Strategies.Introduction to Industrial Policy Resolutions

UNIT IV (4Hrs)

Natural and Technological Environment: Innovation, technological leadership and followership impact of technology on globalization, transfer of technology, time lags in technology introduction, Status of technology in India; Management of technology; Features and Impact of technol

UNITV

International Environment – (12Hrs)
International forces in Business Environment, SEZ, EPZ, GATT/ WTO, Globalization – Meaning, Nature and stages of Globalization, features of Globalization, Foreign Market entry strategies, LPG model. MNCs – Definition, meaning, merits, demerits, MNCs in India, FDI Policy

Course Outcomes (CO) : (Identify minimum skills/ knowledge necessary to be imbibed by students)

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1)** Comprehend the forces that shape business and economic structure and develop strategies to cope with the same.	K3 Comprehending K4 Applying
2	**CO2)** Evaluate the economic & political environmental dynamics to cope with the changing regulations affecting business and its profitability.	K5 Analysing
3	**CO3)**Analyse the competitive forces in environment and accordingly devise business policies and strategies to stay in competitive position.	K5 Analysing
4	**CO4)** Analyze the desirability of technological advancement in the current set-up and how to gain technological advancement with least cost.	K5 Analysing
5	**CO5)** Understand the international influences on domestic business and measures to be taken for successful global business operations	K2 Knowledge

Text Books

1. Environmental Studies, M.P. Poonia & S.C. Sharma, Khanna Publishing House, Delhi

2. Business Environment: Test and Cases, PAUL, McGraw Hill Education, 3rd Ed.
3. Business Environment ---Francis Cherunilam, Himalaya Publishing House

REFERENCE BOOKS:

1. V. Neelamegam – Business Environment (Vrinda Publications , 2nd Edition)
2. Shaikh&Saleem - Business Environment (Pearson, 2nd Edition)
3. International Business Environment—Ian Brooks, Jamie Weatherstom and Grahm Wilkinson
4. Dr. Rimpi, A Textbook of Environment Sciences, Khanna Publishing House

Employable Skills: Employable Skill	**Measurement tools**
Entrepreneurial skill	Workshop on business planning
Managerial competitive skill	Assignment on SWOT analysis
Business acumen	Case studies

HUMAN RESOURCE MANAGEMENT
KMB202

Course Objectives: In this course the students will learn the basic concepts and frameworks of Human Resource Management (HRM) and understand the role that HRM has to play in effective business administration. It will provide an insight as to how to use Human Resource as a tool to implement strategies.

Course Credit: 3 **Contact Hours:36Hrs**

UNIT I: (6 Hours)

Essentials of HRM: Nature of HRM, Scope, functions and importance of HRM, HRM vs.HRD, SHRM: Introduction, characteristics and scope of SHRM, SHRM vs. Conventional HRM, Barriers to strategic HRM, Linking HR strategy with business strategy, HRM linkage with TQM & productivity.

UNIT II: (8 Hours)

Human Resource Planning and Employee Hiring : Nature of job Analysis, job design, Human Resource Planning, Demand forecasting for manpower planning, HR supply forecasting, factors influencing HRP, Employee hiring- Nature of Recruitment, Sources of recruitment, Employee selection, process of employee selection, recent trends in recruitment.

UNIT III: (8 Hours)

Employee Training & Development: Nature and importance of Training, methods and types of training, career planning, promotion, transfer, demotion and separation, Performance Appraisal: Meaning and types of appraisal, Job Evaluation: Meaning and methods of job evaluation.

UNIT IV: (8 Hours)

Compensation Management and Employee Relations: Introduction to compensation management, Components of employee and executive compensation, Factors affecting employee compensation, Employee incentive schemes, and recent trends in compensations management. Meaning and nature of employee relation and industrial relations.

UNIT V: (6 Hours)

Employee Safety/ Health and International Human Resource Management: Basics of ethics and fair treatment at work, measures and policies for employee safety at work, basic principles governing International Human Resource Management and the role of culture.

Course Outcomes: After the successful completion of the course the students will be in a position to address the challenges of organizational management through and with human resources. In addition it will help in:

S.	Course Outcome	Bloom's Taxonomy

No.		
1	**CO1.** Synthesize the role of human resources management as it supports the success of the organization including the effective development of human capital as an agent for organizational change.	**K6** Synthesizing
2	**CO2.** Demonstrate knowledge of laws that impact behaviour in relationships between employers and employees that ultimately impact the goals and strategies of the organization.	**K2** Knowledge
3	**CO3.** Understand the role of employee benefits and compensation as a critical component of employee performance, productivity and organizational effectiveness.	**K3** Comprehending
4	**CO4.**Show evidence of the ability to analyze, manage and problem solve to deal with the challenges and complexities of the practice of collective bargaining.	**K5**Analysing
5	**CO5.** Demonstrate knowledge of practical application of training and employee development as it impacts organizational strategy and competitive advantage.	**K2** Knowledge **K4** Applying

References: Books:

1. V.S.P.Rao, Human Resource Management (Text and Cases) Himalaya Publications, Thirteenth Edition.

2. Durai Praveen, Human Resource Management Pearson Publication, 2nd Edition.

3. Gary Dessler and BijuVarkkeyHuman Resource Management, Person Publication, 2013, 14th Edition.

4. SeemaSanghi, Human Resource Management, VikasPubllications, 2014, 5th Edition.

5. K. Aswathappa, Human Resource Management, McGraw Hill Education, 2013, 7th Edition.

Employable Skills	**Measuring Tools**
Ability to identify and apply the knowledge of subject practically in real corporate situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

BUSINESS RESEARCH METHODS
KMB 203

COURSE OBJECTIVES

1. Understand the concept / fundamentals of research and their types.
2. Understand the practical application of various research techniques.
3. Understand the importance of scaling & measurement techniques and sampling techniques
4. Understand the importance of coding, editing, tabulation and analysis in doing research.
5. Understanding and applying the concept of statistical analysis which includes various parametric test and non parametric test and ANOVA technique and understand technique of report writing.

Credit-3 **Hours-36**

UNIT 1 (8 Sessions)

Research: – Definition, Meaning, Importance types and Qualities of Research; Research applications in functional areas of Business, Emerging trends in Business research.
Research & the Scientific Method: Characteristics of scientific method. Steps in Research Process
Concept of Scientific Enquiry: – Formulation of Research Problem – Management Question – research Question – Investigation Question
Research Proposal – Elements of a Research Proposal, Drafting a Research Proposal, evaluating a research proposal.

UNIT 2 (8 Sessions)

Research design: Concept, Features of a good research design, Use of a good research design; Qualitative and Quantitative research approaches, Comparison – Pros and Cons of both approaches.
Exploratory Research Design: Concept, Types: Qualitative techniques – Projective Techniques, Depth Interview, Experience Survey, Focus Groups, Observation.
Descriptive Research Designs: Concept, types and uses. Concept of Cross-sectional and Longitudinal Research
Experimental Design: Concept of Cause, Causal relationships, Concept of Independent & Dependent variables, concomitant variable, extraneous variable, Treatment, Control group.

UNIT 3 (6 Sessions)

Scaling & measurement techniques: Concept of Measurement: Need of Measurement; Problems in measurement in management research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. Attitude Scaling Techniques: Concept of Scale – Rating Scales viz. Likert Scales, Semantic Differential Scales, Constant Sum Scales, Graphic Rating Scales – Ranking Scales – Paired comparison & Forced Ranking – Concept and Application.

UNIT 4 (6 Sessions)

Sampling: Basic Concepts: Defining the Universe, Concepts of Statistical Population, Sample, Characteristics of a good sample. Sampling Frame (practical approach for determining the sample frame expected), Sampling errors, Non Sampling errors, Methods to reduce the errors, Sample Size constraints, Non Response.

Probability Sample: Simple Random Sample, Systematic Sample, Stratified Random Sample, Area Sampling & Cluster Sampling.

Non Probability Sample: Judgment Sampling, Convenience Sampling, Purposive Sampling, Quota Sampling & Snowballing Sampling methods. Determining size of the sample – Practical considerations in sampling and sample size, sample size determination.

UNIT 5 (8 Sessions)

Data Analysis: Editing, Coding, Tabular representation of data, frequency tables, Construction of frequency distributions, Graphical Representation of Data: Appropriate Usage of Bar charts, Pie charts, Histogram.

Hypothesis: Qualities of a good Hypothesis –Framing Null Hypothesis & Alternative Hypothesis. Concept of Hypothesis Testing – Logic & Importance. Test of Significance: Small sample tests: t-test (Mean, proportion) and F tests, Z test, Cross tabulations, Chi-square test; Analysis of Variance: One way and two-way Classifications.

Mechanism of Report Writing- Report Preparation: Types, Report Structure: preliminary section, main report, interpretation of results, suggestions and recommendations, limitations of the study, Report formulation.

<u>COURSE OUTCOMES</u>

Course Outcomes	**Blooms Taxonomy**
CO1. Knowledge of concept / fundamentals for different types of research.	• Knowledge (K 2)
CO2. Applying relevant research techniques.	• Remembering (K1) • Applying (K 4)
CO3. Understanding relevant scaling & measurement techniques and should use appropriate sampling techniques	• Comprehending (K 3) • Applying (K 4)
CO4.Synthesizing different techniques of coding, editing, tabulation and analysis in doing research.	• Analyzing (K 5) • Synthesizing (K6)
CO5.Evaluating statistical analysis which includes various parametric test and non parametric test and ANOVA technique and prepare report.	• Evaluating (K7)

Text Book

1. Research Methodology, Deepak Chawla, NeenaSondhi, Vikas Publication
2. Business Research Methods, Naval Bajpai, Pearson Education

Reference Book

1) Research Methodology, C R Kothari, New Age International.
2) Business Research Methods by Donald Cooper & Pamela Schindler, TMGH, 9th Edition.
3) Business Research Methods by Alan Bryman& Emma Bell, Oxford University Press, 2ndEdition.
4) Business Research Methods by T N Srivastava&ShailajaRao, TMH Publication, 2ndEdition.

CORPORATE FINANCIAL MANAGEMENT
KMB 204

Course Credit: 3 **Contact Hours:36Hrs**

UNIT I (6 Hrs)

Introduction to Finance & Corporate Finance : Finance & its scope Financial Decisions, Sources of Finance Time Value of Money ,Profit maximization vs. Wealth maximization, Functions of Finance Manager in Modern Age, Corporate Finance Introduction:– Nature and Scope . Concept of Risk and Return.

UNIT II (10 Hrs)

Investment Decision : Concept of Opportunity Cost, Cost of Debenture, Preference and Equity capital, Composite Cost of Capital ,Cash Flows as Profit and components of Cash Flows , Capital Budgeting Decisions, Calculation of NPV and IRR, Excel Application in Analyzing Projects.

UNIT III(10 Hrs)

Financial Decision: Capital Structure, Relevance and Irrelevancy theory, Leverage analysis – financial, operating and combined leverage along with its implications, EBIT EPS Analysis, Point of Indifference
.

UNIT IV (10 Hrs)

Dividend Relevance: Factors affecting Dividend Policy, Forms of Dividends, Types of Dividend Policies, Dividend Models :Walter and Gordon Model, Miller- Modigliani(MM) Hypothesis .

UNIT V (4 Hrs)

Indian Financial System: Role of Financial Institution, Primary and Secondary Market, Lease Financing, Venture Capital, Mutual Funds. Introduction to Derivatives.

Course Outcome:

After successful completion of this course students will be able to

S.No	Course Outcome	Bloom's Taxonomy
1.	**C01** Understand the different basic concept / fundamentals of Corporate Finance	• Knowledge(K2) • Remembering(K1)

2.	**C02** Understand the practical application of time value of money and evaluating long term investment decisions	• Analyzing (K5) • Evaluating(K7)
3.	**C03** Developing analytical skills to select the best source of capital ,its structure on the basis of cost of capital	• Analyzing(K5) • Synthesizing(K6)
4.	**Co4** Understand the use and application of different models for firm's optimum dividend payout.	• Comprehending(K3) • Applying(K4)
5.	**Co5** Understand the recent trends of primary and secondary market and developing skills for application of various financial services.	• Comprehending(K3) • Synthesizing (K6)

Text Books :

1) Khan and Jain - Financial Management (Tata McGraw Hill, 7th Ed.)
2) Pandey I M - Financial Management (Vikas, 11th Ed.)
3) William HakkaBettnerCarcello- Financial and Management Accounting(TMH-16th Ed.)
4)Sheebakapil-Fundamental of financial management (Wiley,2015)
5) Prasanna Chandra - Fundamentals ofFinancial Management (TMH, 9th Ed.)
6) Bark DemazoThampy- Financial Management (Pearson,2nd Ed.)
7) R P Rustagi - Financial Management(Galgotia, 2000, 2nd revised ed.)
8) Damodaran, A., Applied Corporate Finance, 3rd Edition, Wiley, 2012

Reference Books :

1.) Ravi.M Kishore – Financial Management (Taxman, 7th Ed)

2.) Fundamentals to Financial Management , Brigham & Houston, 14/e ,Cengage Learning

3.) Van Horne - Financial Management and Policy (Prentice hall, 2003, 12th Ed.)

4.) Horne Wachowicz- Fundamentals of Financial Management (Pearson,13th Ed)

5.) Lawrence J.Gitman – Principles of Managerial Finance (Pearson Education, 2004)

Operations Management
KMB205

COURSE OBJECTIVES:

- To understand the role of Operations in overall Business Strategy of the firm.
- To understand the application of operations management policies and techniques to the service sector as well as manufacturing firms.
- To identify and evaluate the key factors and their interdependence of these factors in the design of effective operating systems.
- To understand the trends and challenges of Operations Management in the current business environment.
- To familiarize the students with the techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices.

UNIT –I (4 sessions) Production Concept

Difference between Production and Operations Management, Productivity, Work Study, Productivity measurement, Factors affecting Productivity.Production Technology – Types of Manufacturing processes

UNIT –II (6 sessions) Operations Concept

Difference between product and service, Product and service design, Characteristics of service, Classification of service, factors affecting service operations, Service capacity planning, SERVQUAL model of measuring service quality.

UNIT-III (10 sessions) Material and Inventory Management

Types of production planning, process of Production planning and control(PPC) – Routing, Scheduling, Loading, Just-in-time (JIT), KANBAN. Types of inventories, Inventory control techniques- EOQ, ABC and others.(Simple numericals on Inventory control techniques)
Factors affecting Plant Location, Types of Plant layout.

UNIT-IV (10 sessions) Supply Chain Management

Conceptual model of SCM, Supply chain drivers, Demand forecasting in Supply Chain – Simple moving average, weighted moving average, exponential smoothening method, Supply Chain efficiency, Core and reverse Supply Chain, International Supply Chain, Aggregate planning, inbound and outbound SCM, bullwhip effect in SCM.
Latest trend in Production and operation – Lean manufacturing, Agile manufacturing.

UNIT-V (6 sessions) Productivity and Quality

TQM, Deming's 14 principles, PDCA cycle - KAIZEN, Quality Circles, 7QC tools and its advancements, ISO 9000-2000 clauses, Six Sigma, Total Productive Maintenance (TPM), 5S.

SUGGESTED READINGS

1. MAHADEVAN: Operations Management: Theory and Practice (PEARSON) (with MLSA)
2. Chase, Shankar, Jacobs – Operations & Supply Chain Management (Tata McGraw-Hill, 14th Edition)
3. Chary - Production and Operations Management (Tata McGraw-Hill, 1997, 9th Edition)
4. Bisen& Singh - Operation & Logistics Management (Excel Books)
5. R.V.Badi& N.V. Badi - Production & Operation Management (Vrinda Publications 3rd Edition)
6. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Edition)
7. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
8. Adam JrEverett E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)

Expected Course Outcomes:

S.No.	Course Outcomes	Bloom's Taxonomy
CO1.	**U**nderstand the role of Operations in overall Business Strategy of the firm - the application of OM policies and techniques to the service sector as well as manufacturing firms.	• **Knowledge (K2)** • **Comprehending (K 3)** • **Remembering (K1)**
CO2.	Understand and apply the concepts of Material Management, Supply Chain Management and TQM perspectives.	• **Knowledge (K2)** • **Remembering (K1)** • **Applying (K4)**
CO3.	**I**dentify and evaluate the key factors and their interdependence of these factors in the design of effective operating systems.	• **Comprehending (K3)** • **Applying (K4)**
CO4.	Analyze / understand the trends and challenges of Operations Management in the current business environment.	• **Analyzing (K5)**
CO5.	Apply techniques for effective utilization of operational resources and managing the processes to produce good quality products and services at competitive prices.	• **Synthesizing (K6)** • **Evaluating (K7)**

Quantitative Techniques in Management

KMB 206

Course Objectives

To make better decisions in complex scenarios by the application of a set of advanced analytical methods. It couples theories, results and theorems of mathematics, statistics and probability with its own theories and algorithms for problem solving.

Course Credit: 3 **Contact Hours:36Hrs**

UNIT I (4 Sessions)

Operations Research Introduction :- Introduction, Historical Background, Scope of Operations Research , Phases of Operations Research, Types of Operations Research Models, Limitations of Operations Research

UNIT II (10 Sessions)

Linear Programming Problem & Transportation Problem Linear programming: Mathematical formulations of LP Models for product-mix problems; graphical and simplex method of solving LP problems; duality.

Transportation problem: Various methods of finding Initial basic feasible solution-North West Corner Method, Least Cost Method & VAM Method and optimal solution-Stepping Stone & MODI Method, Maximization Transportation Problem

UNIT III (10 Sessions)

Assignment model & Game Theory Assignment model: Hungarian Algorithm and its applications, Maximization Assignment Problem.

Game Theory: Concept of game; Two-person zero-sum game; Pure and Mixed Strategy Games; Saddle Point; Odds Method; Dominance Method and Graphical Method for solving Mixed Strategy Game.

UNIT IV (10 Sessions)

Sequencing & Queuing Theory Sequencing Problem: Johnsons Algorithm for n Jobs and Two machines, n Jobs and Three Machines, Two jobs and m - Machines Problems.

Queuing Theory: Characteristics of M/M/I Queue model; Application of Poisson and Exponential distribution in estimating arrival rate and service rate; Applications of Queue model for better service to the customers.

UNIT V (6 Sessions)

Replacement Problem & Project Management Replacement Problem: Replacement of assets that deteriorate with time, replacement of assets which fail suddenly. Project Management: Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations.

Course Outcome

After successful completion of this course students will be able to

. S.No	Course Outcome	Bloom's taxonomy
1.	**CO1.** Understand the basic operations research concepts and terminology involved in optimization techniques	Knowledge (K2)/ Remembering (k1)
2.	**CO2.**Understand how to interpret and solve business-related problems and	Knowledge (K2)
3.	**CO_3.** Apply certain mathematical techniques in getting the best possible solution to a problem involving limited resources	Applying (K 4)
4.	**CO_4.** Apply the most widely used quantitative techniques in decision making	Applying (K 4)
5.	**CO_5.** Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in order to achieve project success	Synthesizing (K6)/ Evaluating (K7)/

TEXT BOOK

1. R. Panneerselvam - Operations Research (PHI, 2nd Edition)
2. Sharma J K - Operations Research (Pearson, 3rd Edition

REFRENCE BOOKS:

1) Apte-Operation Research and Quantitative Techniques (Excel Books)

2) S Kalawathy-Operation Research (VikasIVth Edition)

3) Natarajan- Operation Research(Pearson)

4) Singh & Kumar—Operation Research(UDH Publisher edition 2013)

5) TahaHamdy - Operations Research - An Introduction (Prentice-Hall, 9th edition)

6) Vohra - Quantitative Techniques in Management (Tata McGraw-Hill, 2nd)

7) Kothari - Quantitative Techniques (Vikas 1996, 3rd Edition).

Legal Aspects of Business
KMB 207

Course Objectives
1. To provide basic understanding of law of contract, Law of agency, Bailment & Pledge
2. To provide basic requirements of Negotiable Instruments Act, Law of Insurance and Law of Partnership for the purpose of conducting business
3. To impart basic provisions of Companies Act concerning incorporation and regulation of business organizations
4. To create an awareness about important legislations namely Sale of Goods Act, Consumer Protection Act, Factories Act having impact on business.
5. To appraise the students on the leading practical application oriented case studies – relevant and updated and analyzing case laws in arriving at conclusions facilitating business decisions.

Course Credits 3 Contact Hours 36 Hrs

UNIT- I (8 hrs)

Law of Contract: Definition, essentials and types of contracts, offer – definition and essentials, acceptance – definition and essentials, consideration – definition and essentials, exceptions to the rule, no consideration, no contract, doctrine of privity of contract, capacity of parties, free consent, quasi contract, legality of object, performance of contract, termination of contract, remedies for breach of contract. Law of Agency: Essentials, kinds of agents, rights and duties of agent and principal, creation of agency, termination of agency

UNIT II (8 hrs)

Negotiable instruments act 1881, Nature and characteristics of Negotiable instruments, kinds of negotiable instruments – promissory notes, bills of exchange and cheques. Parties to negotiable instruments, Negotiation, presentment, discharge and dishonour of negotiable instruments
Law of partnership: Definition, essentials of partnership, formation of partnerships, kinds of partners, authorities, rights and liabilities of partners, registration of partnership, dissolution of partnership firm.

UNIT III (7hrs)

Companies Act: definition, characteristics and kinds of companies, steps in formation of company. Memorandum of association, articles of association, prospectus.
Directors: appointment, power, duties and liabilities, meeting and resolutions: types of meetings. Auditor: appointment, rights and liabilities. modes of winding up of a company.

UNIT IV (6 hrs)

Sale of goods Act: Essentials, sale v/s agreement to sell. Condition v/s warranties, rights of unpaid seller.

Consumer Protection Act: Objectives, definition, consumer protection council and state consumer protection council.

UNITV (7 hrs)

The Information Technology Act, 2000
Definition, Digital Signature, Electronic Governance, Attribution, Acknowledgment and Dispatch of Electronic Records, Sense Electronic Records and Sense Digital Signatures, Regulation of Certifying Authorities, Digital Signature Certificates, Duties of Subscribers, Penalties and Offences.
The Right to Information Act, 2005
Right to know, Salient features of the Act, obligation of public Authority, Designation of Public Information officer, Request for obtaining information, Duties of a PIO, Exemption from disclosure of information, Partial disclosure of information, In formation commissions, powers of Information Commissions, Appellate Authorities, Penalties, Jurisdiction of courts.

Course Outcome

After successful completion of this course students will be able to

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Acquire a sound understanding of the legal aspects of the laws affecting businesses	Knowledge(K2)/Comprehending(K3)
2	**CO2**. Apply basic legal knowledge to business transactions.	Applying (K4)
3	**CO3**. Communicate effectively using standard business and legal terminology	Applying (K4)
4	**CO4.** Analyse a given business context using basic understanding of the applicable Acts and develop a suitable operational framework.	Analyse (K5)
5	**CO5.** Describe current law, rules, and regulations related to settling business disputes	Remembering(K1)/ Applying (K4)

Suggested Readings
1. Kuchhal M.C. - Business Law (Vikas Publication)
2. Gulshan S.S. - Business Law Including Company Law (Excel Books)
3. N D Kapoor – Elements of Mercantile Law – Sultan Chand-2014
4. Dr Avatar Singh- Principles of Mercantile Law, Eastern Book Company 2014
5. NandanKamath- Law relating to Computer, Internet and E-Commerce (A Guide to cyber Laws), Universal Law Publishing Co. Ltd.New Delhi, 2012.
6. Relevant Acts

Employable Skills Skill	**Measurement tool**
Understanding of fundamentals of the legal aspects of the law affecting businesses.	Presentations, Quiz
Understanding of principles of Indian Business Law and Company Law.	Group assignment, Case study analysis
Develop reasoning abilities for applying law principles.	Group assignment, Case study analysis
Develop a suitable legal operational framework.	Quiz, Debate, Case study analysis

MARKETING MANAGEMENT - II
KMB 208

Course Objectives:

- Understand basics of marketing mix.
- Develop effective understanding on product and brand management.
- Develop effective understanding on pricing and distribution management.
- Understand Promotion Management and develop promotion strategies
- Ability to understand Recent Trends in Marketing, Rural Marketing, Digital and Mobile Marketing,. Customer Relationship Management

Course Credit: 3	**Contact Hours:36 Hrs**

COURSE CONTENTS

UNITI

Concept of Marketing Mix: Introduction, Traditional Marketing Mix 4Ps, and 4Cs', Service Marketing Mix, Developing of an Effective Marketing Mix, Managing and Designing Marketing Mix. (7hrs)

UNITII

Product Management: Introduction, Levels of Products, Classification of Products, Product Hierarchy, Product Mix Strategies, Product Line Strategies, Packaging and Labeling, New Product Development Process, Why new products fail, Adoption Process, Diffusion of Innovation, Product Life Cycle (PLC)

Brand Management: Meaning, Advantages and disadvantages of branding, Brand Equity, Brand Positioning, Brand Name Selection, Brand Sponsorship, Brand Portfolio (8hrs)

UNIT III

Pricing: Introduction, Factors Affecting Price Decisions, Pricing Process, Pricing Strategies, Initiating and Responding to the Price Changes. (7hrs)

Distribution Management: Introduction, Need for Marketing Channels, Decisions Involved in Setting up the Channel, Channel Management Strategies, Introduction to Logistics Management, Retailing Meaning, Types, Wholesaling- Meaning, Types, Multi Channel Marketing, Vertical and Horizontal Marketing System. (8 hrs)

UNIT IV

Promotion Management-: Introduction, Integrated Marketing Communications (IMC), Communication Development Process, Budget Allocation Decisions in Marketing Communications, Promotion Mix, Advertising- Meaning, Objectives, Advertising Budget Fundamentals of Sales Promotion, Public Relations, Direct Marketing, (7hrs)

UNITV

Recent Trends in Marketing- Rural Marketing- Meaning, Characteristics of Rural Market. Digital and Mobile Marketing Meaning & types (6hrs)

Customer Relationship Management: Meaning, Relationship Marketing Vs. Relationship Management, Types of Relationship Management, Significance of Customer Relationship Management .

S.No	Course Outcome	Bloom's taxonomy
1	**CO1.** Understand and Analyze marketing for creating value with Product and price Strategy.	**Remembering (K1)**
2	**CO2.**Develop aptitude to Create and Craft the Brand Positioning/ Equity by Evaluating Brands and Identifying Market Segments and Targets	**Comprehending (K 3) / Knowledge (K2)**
3	**CO3.** Understand and Analyze marketing for delivering and communicating value with Integrated Marketing Channels and promotion strategy.	**Analyzing (K 5) / Applying (K 4)**
4	**CO4.** Remember and Comprehend advance marketing concepts for the New Realities and digital aspect of marketing.	**Evaluating (K7)**
5	**CO5.**Creating and developing marketing strategies and plans for Conducting marketing responsibly for long-term success	**Synthesizing (K6)**

TEXT BOOKS:

1) Marketing Management: A South Asian Perspective - Kotler, Keller, Kevin 15/e, Pearson Education, 2016.

2) Fundamentals of Marketing Management - Etzel M. J, B J Walker & William J. Stanton, 14/e, McGrawHill Education Publishers, 2015.

3) Marketing: Asian EditionPaulBainies, Chris Fill Kelly Page third edition, Oxford.

REFERENCE BOOKS:

1) Marketing: An Introduction - Rosalind Masterson & David Pickton, 2/e, Sage Publications, 2010.

2) Marketing Management- Russ Winer, Ravi Bhar 4/e Pearson Education 2015.

3) Principles & Practices of Management – Dr. Premvir Kapoor, Khanna Publishing House, Delhi.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Evaluation Scheme & Syllabus for

B. Tech.

(All Branches except Agriculture & Bio Tech)

AS PER
AICTE MODEL CURRICULUM

(Effective from the Session: 2018-19)

B. Tech 1st Year (All branches except Bio Technology and Agriculture Engg.) Structure in accordance with AICTE Model Curriculum Effective w.e.f. Academic Session 2018-19

SEMESTER - I

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM													
1	**KAS101/ KAS102**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS103**	Mathematics-I	3	1	0	30	20	50	-	100	-	150	4
3	**KEE 101/ KCS101**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE101/ KWS101**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										600	17.5

SEMESTER II

Sl. No.	Code	SUBJECT	PERIODS			EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	Total	PS	TE	PE		
1	**KAS201/ KAS202**	Physics/Chemistry	3	1	3	30	20	50	25	100	25	200	5.5
2	**KAS203**	Mathematics II	3	1	0	30	20	50	-	100	-	150	4
3	**KEE201/ KCS201**	Basic Electrical Engineering/Programming for Problem Solving	3	1	2	30	20	50	25	100	25	200	5
4	**KCE201/ KWS201**	Engineering Graphics & Design/Workshop Practices	1	0	4	-	-	-	25	-	25	50	3
5	**KAS204**	Professional English	2	0	2	30	20	50	-	100	-	150	3
	MOOCs (For B.Tech. Hons. Degree**)***												0
		TOTAL										750	20.5
Mini Project or Internship (3-4 weeks) shall be conducted during summer break after II semester and will be assessed during III semester													

*** List of MOOCs (NPTL) Based Recommended Courses for first year B. Tech Students**

1. Developing Soft Skills and personality-Odd Semester-8 Weeks-3 Credits
2. Enhancing Soft Skills and personality-Even Semester-8 Weeks-3 Credits

*** AICTE Guidelines in Model Curriculum:**

After successful completion of 160 credits, a student shall be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours only, if he/she completes additional university recommended courses only (Equivalent to 20 credits; NPTEL Courses of 4 Weeks, 8 Weeks and 12 Weeks shall be of 2, 3 and 4 Credits respectively) through MOOCs. For registration to MOOCs Courses, the students shall follow NPTEL Site http://nptel.ac.in/ as per the NPTEL policy and norms. The students can register for these courses through NPTEL directly as per the course offering in Odd/Even Semesters at NPTEL. These NPTEL courses (recommended by the University) may be cleared during the B. Tech degree program (not necessary one course in each semester). After successful completion of these MooCs courses the students, shall, provide their successful completion NPTEL status/certificates to the University (COE) through their college of study only. The student shall be awarded Hons. Degree (on successful completion of MOOCS based 20 credit) only if he/she secures 7.50 or above CGPA and passed each subject of that Degree Programme in single attempt without any grace marks.

SEMESTER – I

A Guide to Induction Program

1 Introduction

(Induction Program was discussed and approved for all colleges by AICTE in March 2017. It was discussed and accepted by the Council of IITs for all IITs in August 2016. It was originally proposed by a Committee of IIT Directors and accepted at the meeting of all IIT Directors in March 2016.[1] This guide has been prepared based on the Report of the Committee of IIT Directors and the experience gained through its pilot implementation in July 2016 as accepted by the Council of IITs. Purpose of this document is to help institutions in understanding the spirit of the accepted Induction Program and implementing it.)

Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his study. However, he must also have broad understanding of society and relationships. Character needs to be nurtured as an essential quality by which he would understand and fulfill his responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.

There is a mad rush for engineering today, without the student determining for himself his interests and his goals. This is a major factor in the current state of demotivation towards studies that exists among UG students. The success of gaining admission into a desired institution but failure in getting the desired branch, with peer pressure generating its own problems, leads to a peer environment that is demotivating and corrosive. Start of hostel life without close parental supervision at the same time, further worsens it with also a poor daily routine.

To come out of this situation, a multi-pronged approach is needed. One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them

A Committee of IIT Directors was setup in the 152nd Meeting of IIT Directors on 6th September 2015 at IIT Patna, on how to motivate undergraduate students at IITs towards studies, and to develop verbal ability. The Committee submitted its report on 19th January 2016. It was considered at the 153rd Meeting of all IIT Directors at IIT Mandi on 26 March 2016, and the accepted report came out on 31

March 2016. The Induction Program was an important recommendation, and its pilot was implemented by three IITs, namely, IIT(BHU), IIT Mandi and IIT Patna in July 2016. At the 50th meeting of the Council of IITs on 23 August 2016, recommendation on the Induction Program and the report of its pilot implementation were discussed and the program was accepted for all IITs, work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character.

2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Precious little is done by most of the institutions, except for an orientation program lasting a couple of days.

We propose a 3-week long induction program for the UG students entering the institution, right at the start. Normal classes start only after the induction program is over. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.[2]

The time during the Induction Program is also used to rectify some critical lacunas, for example, English background, for those students who have deficiency in it. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

[2]Induction Program as described here borrows from three programs running earlier at different institutions: (1) Foundation Program running at IIT Gandhinagar since July 2011, (2) Human Values course running at IIIT Hyderabad since July 2005, and (3) Counselling Service or mentorship running at several IITs for many decades. Contribution of each one is described next.

1. IIT Gandhinagar was the first IIT to recognize and implement a special 5-week Foundation Program for the incoming 1st year UG students. It took a bold step that the normal classes would start only after the five week period. It involved activities such as games, art, etc., and also science and other creative workshops and lectures by resource persons from outside.

2. IIIT Hyderabad was the first one to implement a compulsory course on Human Values. Under it, classes were held by faculty through discussions in small groups of students, rather than in lecture mode. Moreover, faculty from all departments got involved in conducting the group discussions under the

course. The content is non-sectarian, and the mode is dialogical rather than sermonising or lecturing. Faculty were trained beforehand, to conduct these discussions and to guide students on issues of life.

3. Counselling at some of the IITs involves setting up mentor-mentee network under which 1st year students would be divided into small groups, each assigned a senior student as a student guide, and a faculty member as a mentor. Thus, a new student gets connected to a faculty member as well as a senior student, to whom he/she could go to in case of any difficulty whether psychological, financial, academic, or otherwise.

The Induction Program defined here amalgamates all the three into an integrated whole, which leads to its high effectiveness in terms of building physical activity, creativity, bonding, and character. It develops sensitivity towards self and one's relationships, builds awareness about others and society beyond the individual, and also in bonding with their own batch-mates and a senior student besides a faculty member.

Scaling up the above amalgamation to an intake batch of 1000 plus students was done at IIT(BHU), Varanasi starting from July 2016.

2.1 Physical Activity

This would involve a daily routine of physical activity with games and sports. It would start with all students coming to the field at 6 am for light physical exercise or yoga. There would also be games in the evening or at other suitable times according to the local climate. These would help develop team work. Each student should pick one game and learn it for three weeks. There could also be gardening or other suitably designed activity where labour yields fruits from nature.

2.2 Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it every day for the duration of the program.

These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

2.3 Universal Human Values

It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, take decisions with courage, be aware of relationships with colleagues and supporting staff in the hostel and department, be sensitive to others, etc. Need for character building has been underlined earlier. A module in Universal Human Values provides the base.

Methodology of teaching this content is extremely important. It must not be through do's and dont's, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values.

The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them.[3]

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program.

Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

The Universal Human Values Course is a result of a long series of experiments at educational institutes starting from IIT-Delhi and IIT Kanpur in the 1980s and 1990s as an elective course, NIT Raipur in late 1990s as a compulsory one-week off campus program. The courses at IIT(BHU) which started from July 2014, are taken and developed from two compulsory courses at IIIT Hyderabad first introduced in July 2005.

2.4 Literary

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

2.5 Proficiency Modules

This period can be used to overcome some critical lacunas that students might have,

for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

2.6 Lectures by Eminent People

This period can be utilized for lectures by eminent people, say, once a week. It would give the students exposure to people who are socially active or in public life.

2.7 Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the under privileged.

2.8 Familiarization to Dept./Branch & Innovations

The students should be told about different method of study compared to coaching that is needed at IITs. They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

3 Schedule

The activities during the Induction Program would have an Initial Phase, a Regular Phase and a Closing Phase. The Initial and Closing Phases would be two days each.

3.1 Initial Phase

Time	Activity
Day 0	
Whole day	Students arrive - Hostel allotment. (Preferably do pre allotment)
Day 1	
09:00 am - 03:00 pm	Academic registration
04:30 pm - 06:00 pm	Orientation
Day 2	
09:00 am - 10:00 am	Diagnostic test (for English etc.)
10:15 am - 12:25 pm	Visit to respective depts.
12:30 pm - 01:55 pm	Lunch
02:00 pm - 02:55 pm	Director's address
03:00 pm - 05:00 pm	Interaction with parents
03:30 pm - 05:00 pm	Mentor-mentee groups - Introduction within group. (Same as Universal Human Values groups)

3.2 Regular Phase

After two days is the start of the Regular Phase of induction. With this phase there would be regular program to be followed every day.

3.2.1 Daily Schedule

Some of the activities are on a daily basis, while some others are at specified periods
within the Induction Program. We first show a typical daily timetable.

Session.	Time	Activity	Remarks
Day 3 onwards			
	06:00 am	Wake up call	
I	06:30 am - 07:10 am	Physical activity (mild exercise/ yoga)	
	07:15 am - 08:55 am	Bath, Breakfast, etc.	
II	09:00 am - 10:55 am	Creative Arts / Universal Human Values	Half the groups do Creative Arts
III	11:00 am - 12:55 pm	Universal Human Values/ Creative Arts	Complementary alternate
	01:00 pm - 02:25 pm	Lunch	
IV	02:30 pm - 03:55 pm	Afternoon Session See below.	
V	04:00 pm - 05:00 pm	Afternoon Session See below.	
	05:00 pm - 05:25 pm	Break / light tea	
VI	05:30 pm - 06:45 pm	Games / Special Lectures	
	06:50 pm - 08:25 pm	Rest and Dinner	
VII	08:30 pm - 09:25 pm	Informal interactions (in hostels)	

Sundays are off. Saturdays have the same schedule as above or have outings.

3.2.2 Afternoon Activities (Non-Daily)

The following five activities are scheduled at different times of the Induction Program, and are not held daily for everyone:

1. Familiarization to Dept./Branch & Innovations
2. Visits to Local Area
3. Lectures by Eminent People
4. Literary
5. Proficiency Modules

Here is the approximate activity schedule for the afternoons (may be changed to suit local needs):

Activity	Session	Remarks
Familiarization with Dept/Branch & Innovations	IV	For 3 days (Day 3 to 5)
Visits to Local Area	IV, V and VI	For 3 days - interspersed (e.g., 3 Saturdays)
Lectures by Eminent People	IV	As scheduled - 3-5 lectures
Literary (Play / Book	IV	For 3-5 days

Reading / Lecture)		
Proficiency Modules	V	Daily, but only for those who need it

3.3 Closing Phase

Time	**Activity**
Last But One Day	
08:30 am - 12 noon	Discussions and finalization of presentation within each group
02:00 am - 05:00 pm	Presentation by each group in front of 4 other groups besides their own (about 100 students)
Last Day	
Whole day	Examinations (if any). May be expanded to last 2 days, in case needed.

3.4 Follow Up after Closure

A question comes up as to what would be the follow up program after the formal 3-week Induction Program is over? The groups which are formed should function as mentor mentee network. A student should feel free to approach his faculty mentor or the student guide, when facing any kind of problem, whether academic or financial or psychological etc. (For every 10 undergraduate first year students, there would be a senior student as a student guide, and for every 20 students, there would be a faculty mentor.) Such a group should remain for the entire 4-5 year duration of the stay of the student. Therefore, it would be good to have groups with the students as well as teachers from the same department/discipline. Here we list some important suggestions which have come up and which have been experimented with.

3.4.1 Follow Up after Closure – Same Semester

It is suggested that the groups meet with their faculty mentors once a month, within the semester after the 3-week Induction Program is over. This should be a scheduled meeting shown in the timetable. (The groups are of course free to meet together on their own more often, for the student groups to be invited to their faculty mentor's home for dinner or tea, nature walk, etc.)

3.4.2 Follow Up – Subsequent Semesters

It is extremely important that continuity be maintained in subsequent semesters.
It is suggested that at the start of the subsequent semesters (upto fourth semester), three days be set aside for three full days of activities related to follow up to Induction Program. The students be shown inspiring films, do collective art work, and group discussions be conducted. Subsequently, the groups should meet at least once a month.

4 Summary

Engineering institutions were set up to generate well trained manpower in engineering with a feeling of responsibility towards oneself, one's family, and society. The incoming undergraduate students are driven by their parents and society to join engineering without understanding their own interests and talents. As a result, most students fail to link up with the goals of their own institution.

The graduating student must have values as a human being, and knowledge and meta skills related to his/her profession as an engineer and as a citizen. Most students who get demotivated to study engineering or their branch, also lose interest in learning.
The Induction Programis designed to make the newly joined students feel comfortable, sensitize them towards exploring their academic interests and activities, reducing competition and making them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and building of character.

The Universal Human Valuescomponent, which acts as an anchor, develops awareness and sensitivity, feeling of equality, compassion and oneness, draw attention to society and we are aware that there are advantages in mixing the students from different depts. However, in mixing, it is our experience that the continuity of the group together with the faculty mentor breaks down soon after. Therefore, the groups be from the same dept. but hostel wings have the mixed students from different depts. For example, the hostel room allotment should be in alphabetical order irrespective of dept. nature, and character to follow through. It also makes them reflect on their relationshipwith their families and extended family in the college (with hostel staff and others). It alsoconnects students with each other and with teachers so that they can share any difficultythey might be facing and seek help.

References:

Motivating UG Students Towards Studies, Rajeev Sangal, IITBHU Varanasi, Gautam Biswas, IIT Guwahati, Timothy Gonsalves, IIT Mandi, Pushpak Bhattacharya, IIT Patna, (Committee of IIT Directors), 31 March 2016, IIT Directors' Secretariat, IIT Delhi.

Contact:

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Director, IIT(BHU), Varanasi
(director@iitbhu.ac.in)
18 June 2017

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics: Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.
Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)
3. Optics - Brijlal& Subramanian (S. Chand)
4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)
5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)
6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

Physics Lab

List of Experiments

Any ten experiments (at least four from each group).

Group A

1. To determine the wavelength of sodium light by Newton's ring experiment.
2. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
3. To determine the specific rotation of cane sugar solution using polarimeter.
4. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
5. To measure attenuation in an optical fiber.
6. To determine the wavelength of He-Ne laser light using single slit diffraction.
7. To study the polarization of light using He-Ne laser light.
8. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
9. To determine the coefficient of viscosity of a given liquid.
10. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

1. To determine the energy band gap of a given semiconductor material.
2. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To verify Stefan's law by electric method.
5. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
6. To study the resonance condition of a series LCR circuit.
7. To determine the electrochemical equivalent (ECE) of copper.
8. To calibrate the given ammeter and voltmeter by potentiometer.
9. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
10. To measure high resistance by leakage method.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

CHEMISTRY

Module-1 **[08]**
Atomic and Molecular Structure:
Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**
Spectroscopic techniques and Applications:
Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**
Electrochemistry
Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and ΔS). Lead storage battery.
Corrosion; causes, effects and its prevention.
Phase Rule and its application to water system.

Module-4 **[08]**
Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).
Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**
Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
6. Polymer Chemistry ByFre W., Billmeyer
7. Engineering ChemistryBy Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-I

(Common to all B. Tech. Courses except B. Tech. (Biotechnology)&B. Tech. (Agricultural Engineering)

Module 1: Matrices [08]

Types of Matrices: Symmetric, Skew-symmetric and Orthogonal Matrices; Complex Matrices, Inverse and Rank of matrix using elementary transformations, Rank-Nullity theorem; System of linear equations, Characteristic equation, Cayley-Hamilton Theorem and its application, Eigen values and eigenvectors; Diagonalisation of a Matrix,

Module 2: Differential Calculus- I [08]

Introduction to limits, continuity and differentiability, Rolle's Theorem, Lagrange's Mean value theorem and Cauchy mean value theorem, Successive Differentiation (n^{th} order derivatives), Leibnitz theorem and its application, Envelope, Involutes and Evolutes, Curve tracing: Cartesian and Polar co-ordinates

Module 3: Differential Calculus-II [08]

Partial derivatives, Total derivative, Euler's Theorem for homogeneous functions, Taylor and Maclaurin's theorems for a function of one and two variables, Maxima and Minima of functions of several variables, Lagrange Method of Multipliers, Jacobians, Approximation of errors.

Module 4: Multivariable Calculus-I [08]

Multiple integration: Double integral, Triple integral, Change of order of integration, Change of variables, **Application:** Areas and volumes, Center of mass and center of gravity (Constant and variable densities),

Module 5: Vector Calculus [08]

Vector differentiation: Gradient, Curl and Divergence and their Physical interpretation, Directional derivatives, Tangent and Normal planes.

Vector Integration: Line integral, Surface integral, Volume integral, Gauss's Divergence theorem, Green's theorem, Stoke's theorem (without proof) and their applications.

COURSE OUTCOMES

1. Remember the concept of matrices and apply for solving linear simultaneous equations.
2. Understand the concept of limit, continuity and differentiability and apply in the study of Rolle,s , Lagrange,s and Cauchy mean value theorem and Leibnitz theorems .
3. Identify the application of partial differentiation and apply for evaluating maxima, minima, series and Jacobians.
4. Illustrate the working methods of multiple integral and apply for finding area, volume, centre of mass and centre of gravity.
5. Remember the concept of vector and apply for directional derivatives, tangent and normal planes. Also evaluate line, surface and volume integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata Mc Graw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R K. Jain & S R K. Iyenger , Advance Engineering Mathematics, Narosa Publishing House 2002.

Reference Books-

1.E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.

2.Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.

3.Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas, Calculus, Eleventh Edition, Pearson.

4.D. Poole, Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.

5.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

6.Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, Tata Mc-Graw-Hill; Sixth Edition.

7.P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd

8. Advanced Engineering Mathematics. Chandrika Prasad, Reena Garg, 2018.

9. Engineering Mathemathics – I. Reena Garg, 2018.

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits **[08]**

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits **[10]**

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers **[08]**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines **[08]**

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations **[06]**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : (Introduction to Programming) **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : (Arithmetic expressions & Conditional Branching) **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : (Loops & Functions) **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : (Arrays & Basic Algorithms) **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, Passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :(Pointer& File Handling) **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson
   Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%--------------Print 'A'

80-90%----------------------------Print 'B'

60-80%---------------------------Print 'C'

Below 60%----------------------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.

21. WAP that simply takes elements of the array from the user and finds the sum of these elements.

22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections **[08]**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids **[08]**

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections **[08]**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics **[08]**

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multiview, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project **[08]**

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain, Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

SEMESTER - II

PHYSICS

Module - 1 Relativistic Mechanics: [8]

Frame of reference, Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Postulates of special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, Variation of mass with velocity, Einstein's mass energy relation, Relativistic relation between energy and momentum, Massless particle.

Module- 2 Electromagnetic Field Theory: [8]

Continuity equation for current density, Displacement current, Modifying equation for the curl of magnetic field to satisfy continuity equation, Maxwell's equations in vacuum and in non-conducting medium, Energy in an electromagnetic field, Poynting vector and Poynting theorem, Plane electromagnetic waves in vacuum and their transverse nature. Relation between electric and magnetic fields of an electromagnetic wave, Energy and momentum carried by electromagnetic waves, Resultant pressure, Skin depth.

Module- 3 Quantum Mechanics: [8]

Black body radiation, Stefan's law, Wien's law, Rayleigh-Jeans law and Planck's law, Wave particle duality, Matter waves, Time-dependent and time-independent Schrodinger wave equation, Born interpretation of wave function, Solution to stationary state Schrodinger wave equation for one-Dimensional particle in a box, Compton effect.

Module- 4 Wave Optics: [10]

Coherent sources, Interference in uniform and wedge shaped thin films, Necessity of extended sources, Newton's Rings and its applications. Fraunhoffer diffraction at single slit and at double slit, Absent spectra, Diffraction grating, Spectra with grating, Dispersive power, Resolving power of grating, Rayleigh's criterion of resolution, Resolving power of grating.

Module- 5Fibre Optics & Laser: [10]

Fibre Optics**:** Introduction to fibre optics, Acceptance angle, Numerical aperture, Normalized frequency, Classification of fibre, Attenuation and Dispersion in optical fibres.

Laser: Absorption of radiation, Spontaneous and stimulated emission of radiation, Einstein's coefficients, Population inversion, Various levels of Laser, Ruby Laser, He-Ne Laser, Laser applications.

Course Outcomes:

1. To solve the classical and wave mechanics problems
2. To develop the understanding of laws of thermodynamics and their application in various processes
3. To formulate and solve the engineering problems on Electromagnetism & Electromagnetic Field Theory
4. To aware of limits of classical physics & to apply the ideas in solving the problems in their parent streams

Reference Books:

1. Concepts of Modern Physics - AurthurBeiser (Mc-Graw Hill)

2. Introduction to Special Theory of Relativity- Robert Resnick (Wiley)

3. Optics - Brijlal& Subramanian (S. Chand)

4. Engineering Physics: Theory and Practical- Katiyar and Pandey (Wiley India)

5. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New)

6. Engineering Physics-Malik HK and Singh AK (McGrawHill)

PHYSICS LAB

List of Experiments (Any ten experiments (at least four from each group).

Group A

11. To determine the wavelength of sodium light by Newton's ring experiment.
12. To determine the wavelength of different spectral lines of mercury light using plane transmission grating.
13. To determine the specific rotation of cane sugar solution using polarimeter.
14. To determine the focal length of the combination of two lenses separated by a distance and verify the formula for the focal length of combination of lenses.
15. To measure attenuation in an optical fiber.
16. To determine the wavelength of He-Ne laser light using single slit diffraction.
17. To study the polarization of light using He-Ne laser light.
18. To determine the wavelength of sodium light with the help of Fresnel's bi-prism.
19. To determine the coefficient of viscosity of a given liquid.
20. To determine the value of acceleration due to gravity (g) using compound pendulum.

Group B

11. To determine the energy band gap of a given semiconductor material.
12. To study Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall effect setup.
13. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
14. To verify Stefan's law by electric method.
15. To determine resistance per unit length and specific resistance of a given resistance using Carey Foster's Bridge.
16. To study the resonance condition of a series LCR circuit.
17. To determine the electrochemical equivalent (ECE) of copper.
18. To calibrate the given ammeter and voltmeter by potentiometer.
19. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.
20. To measure high resistance by leakage method.

Course Outcomes:

1. To determine the wavelength of sodium light by Newton's ring experiment
2. To determine the wavelength of sodium light with the help of Fresnel's bi-prism
3. To determine the variation of magnetic field with the distance along the axis of a current carrying coil and estimate the radius of the coil.
4. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss.

Reference Books

1. Practical Physics- K. K. Dey & B. N. Dutta (Kalyani Publishers New Delhi)
2. Engineering Physics-Theory and Practical- Katiyar& Pandey (Wiley India)
3. Engineering Physics Practical- S K Gupta (KrishnaPrakashan Meerut)

CHEMISTRY

Module-1 **[08]**

Atomic and Molecular Structure:

Molecular orbital's of diatomic molecules. Band theory of solids. Liquid crystal and its applications. Point defects in solids. Structure and applications of Graphite and Fullerenes. Concepts of Nanomaterials and its application.

Module-2 **[08]**

Spectroscopic techniques and Applications:

Elementary idea and simple applications of Rotational, Vibrational, Ultraviolet& Visible and Raman spectroscopy.

Module-3 **[08]**

Electrochemistry

Nernst Equation and application, relation of EMF with thermodynamic functions (ΔH, ΔF and Δ S). Lead storage battery.

Corrosion; causes, effects and its prevention.

Phase Rule and its application to water system.

Module-4 **[08]**

Water Analysis; Hardness of water, Techniques for water softening (Lime-soda, Zeolite, Ion exchange resin and Reverse osmosis method).

Fuels: classification of fuels, Analysis of coal, Determination of calorific value (Bomb calorimeterand Dulong'smethos).

Module-5 **[08]**

Polymer; Basic concepts of polymer-Blend and composites, Conducting and biodegradable polymers. Preparation and application of some industrially important polymers (Buna-S, Buna-N, Neoprene, Nylon-6, nylon-6,6 and Terylene). General methods of synthesis of organometallic compounds (Grignard reagent) and their applications.

Course Outcomes:

1. Get an understanding of the theoretical principles understanding molecular structure, bonding and properties.
2. Know the fundamental concepts of determination of structure with various techniques.
3. Know the fundamental concepts of chemistry applicable in industrial processes.

Reference Books:

1. University Chemistry By B.H. Mahan
2. University Chemistry By C.N.R. Rao
3. Organic Chemistry By I.L. Finar
4. Physical Chemistry By S. Glasstone
5. Engineering Chemistry By S.S. Dara
7. Polymer Chemistry ByFre W., Billmeyer
8. Engineering Chemistry By Satya Prakash

CHEMISTRY- PRACTICAL

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA.
3. Determination of iron content in the given solution by Mohr's method.
4. Determination of viscosity of given liquid.
5. Determination of surface tension of given liquid.
6. Determination of chloride content in water sample.
7. Determination of available chlorine in bleaching powder.
8. Determination of pH by pH-metric titration.
9. Preparation of Phenol-formaldehyde and Urea-formaldehyde resin.
10. Determination of Cell constant and conductance of a solution.
11. Determination of rate constant of hydrolysis of esters.
12. Verification of Beer's law.

NOTE: Choice of any 10 experiments from the above. Institute can change any 02 experiments from the aforesaid experiments.

Course Outcomes:

1. Use of different analytical instruments.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solution, chloride and iron content in water.
3. Measure hardness of water.
4. Estimate the rate constant of reaction.

MATHEMATICS-II

(Common to all B. Tech. Courses except B. Tech., Biotechnology and Agricultural Engineering)

Module 1: Ordinary Differential Equation of Higher Order [10]

Linear differential equation of n^{th} order with constant coefficients, Simultaneous linear differential equations, Second order linear differential equations with variable coefficients, Solution by changing independent variable, Reduction of order, Normal form, Method of variation of parameters, Cauchy-Euler equation, Series solutions (Frobenius Method).

Module 2: Multivariable Calculus-II [08]

Improper integrals, Beta & Gama function and their properties, Dirichlet's integral and its applications, Application of definite integrals to evaluate surface areas and volume of revolutions.

Module 3: Sequences and Series [08]

Definition of Sequence and series with examples, Convergence of sequence and series, Tests for convergence of series, (Ratio test, D' Alembert's test, Raabe's test). Fourier series, Half range Fourier sine and cosine series.

Module 4: Complex Variable – Differentiation [08]

Limit, Continuity and differentiability, Functions of complex variable, Analytic functions, Cauchy- Riemann equations (Cartesian and Polar form), Harmonic function, Method to find Analytic functions, Conformal mapping, Mobius transformation and their properties

Module 5: Complex Variable –Integration [08]

Complex integrals, Contour integrals, Cauchy- Goursat theorem, Cauchy integral formula, Taylor's series, Laurent's series, Liouvilles's theorem, Singularities, Classification of Singularities, zeros of analytic functions, Residues, Methods of finding residues, Cauchy Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{\infty} f(x)\, dx$.

COURSE OUTCOMES

1. Understand the concept of differentiation and apply for solving differential equations.
2. Remember the concept of definite integral and apply for evaluating surface areas and volumes.
3. Understand the concept of convergence of sequence and series. Also evaluate Fourier series
4. Illustrate the working methods of complex functions and apply for finding analytic functions.
5. Apply the complex functions for finding Taylor's series, Laurent's series and evaluation of definite integrals.

Text Books:-

1. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publisher, 2005.
3. R. K. Jain & S. R. K. Iyenger , Advance Engineering Mathematics , Narosa Publishing -House, 2002.

Reference Books:-

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. Maurice D. Weir, Joel Hass, Frank R.Giordano, Thomas, Calculus, Eleventh Edition, Pearson.
4. G.B Thomas, R L Finney, Calculus and Analytical Geometry, Ninth Edition Pearson, 2002.
5. James Ward Brown and Ruel V Churchill, Fourier Series and Boundary Value Problems, 8th Edition-Tata McGraw-Hill

6. D. Poole , Linear Algebra : A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

8. Charles E Roberts Jr, Ordinary Diffrential Equations, Application, Model and Computing, CRC Press T&F Group.
9. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, 6th Edition, Tata McGraw-Hill.
10. James Ward Brown and Ruel V Churchill, Complex Variable and Applications, 8th Edition, Tata McGraw-Hill.
11. P. Sivaramakrishna Das and C. Vijayakumari, Engineering Mathematics, 1st Edition, Pearson India Education Services Pvt. Ltd.
12. Advanced Engineering Mathematics By Chandrika Prasad, Reena Garg Khanna Publishing House, Delhi

BASIC ELECTRICAL ENGINEERING

Module - 1: DC Circuits [08]

Electrical circuit elements (R, L and C), Concept of active and passive elements, voltage and current sources, concept of linearity and linear network, unilateral and bilateral elements, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation, Superposition theorem, Thevenin theorem, Norton theorem.

Module - 2: Steady- State Analysis of Single Phase AC Circuits [10]

Representation of Sinusoidal waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Analysis of single phase AC Circuits consisting of R, L, C, RL, RC, RLC combinations (Series and Parallel), Apparent, active & reactive power, Power factor, power factor improvement. Concept of Resonance in series & parallel circuits, bandwidth and quality factor.

Three phase balanced circuits, voltage and current relations in star and delta connections.

Module - 3 : Transformers [08]

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

Module –4 : Electrical machines [08]

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Module –5 : Electrical Installations [06]

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Importance of earthing. Types of Batteries, Important characteristics for Batteries.Elementary calculations for energy consumption and savings, battery backup.

COURSE OUTCOMES

1. Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
2. Analyze the steady state behavior of single phase and three phase AC electrical circuits.
3. Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency. Also identify the connections of a three phase transformer.
4. Illustrate the working principles of induction motor, synchronous machine as well as DC machine and employ them in different area of applications.
5. Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

Spoken Tutorial (MOOCs):

1. AC DC Circuit Analysis using NgSpice, Open Source Software (http://spoken-tutorial.org)

Text Books:

1. Ritu Sahdev, "Basic Electrical Engineering", Khanna Publishing House.

2. S. Singh, P.V. Prasad, "Electrical Engineering: Concepts and Applications" Cengage.

3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill.

4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill.

Reference Books:

1. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.

2. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press.

3. V. D. Toro, "Electrical Engineering Fundamentals", Pearson India.

ELECTRICAL ENGINEERING LABORATORY

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed.

1. Verification of Kirchhoff's laws
2. Verification of Superposition and Thevenin Theorem.
3. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
4. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
5. Connection and measurement of power consumption of a fluorescent lamp (tube light).
6. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
7. Determination of parameters of ac single phase series RLC circuit
8. To observe the B-H loop of a ferromagnetic material in CRO.
9. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
10. Determination of efficiency of a dc shunt motor by load test
11. To study running and speed reversal of a three phase induction motor and record speed in both directions.
12. Demonstration of cut-out sections of machines: dc machine, three phase induction machine, single-phase induction machine and synchronous machine.

COURSE OUTCOMES

1. Conduct experiments illustrating the application of KVL/KCL and network theorems to DC electrical circuits.
2. Demonstrate the behavior of AC circuits connected to single phase AC supply and measure power in single phase as well as three phase electrical circuits.
3. Perform experiment illustrating BH curve of magnetic materials.
4. Calculate efficiency of a single phase transformer and DC machine.
5. Perform experiments on speed measurement and reversal of direction of three phase induction motor and Identify the type of DC and AC machines based on their construction.

Programming for Problem Solving

Module – 1 : (Introduction to Programming) **[08]**

Introduction to components of a computer system: Memory, processor, I/O Devices, storage, operating system, Concept of assembler, compiler, interpreter, loader and linker.

Idea of Algorithm: Representation of Algorithm, Flowchart, Pseudo code with examples, From algorithms to programs, source code.

Programming Basics: Structure of C program, writing and executing the first C program, Syntax and logical errors in compilation, object and executable code. Components of C language. Standard I/O in C, Fundamental data types, Variables and memory locations, Storage classes.

Module – 2 : (Arithmetic expressions & Conditional Branching) **[08]**

Arithmetic expressions and precedence: Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Conditional Branching: Applying if and switch statements, nesting if and else, use of break and default with switch.

Module – 3 : (Loops & Functions) **[08]**

Iteration and loops: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.

Module – 4 : (Arrays & Basic Algorithms) **[08]**

Arrays: Array notation and representation, manipulating array elements, using multi-dimensional arrays. Character arrays and strings, Structure, union, enumerated data types, Array of structures, passing arrays to functions.

Basic Algorithms: Searching &Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, Notion of order of complexity.

Module – 5 :(Pointer& File Handling) **[08]**

Pointers: Introduction, declaration, applications, Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Use of pointers in self-referential structures, notion of linked list (no implementation)

File handling: File I/O functions, Standard C preprocessors, defining and calling macros, command-line arguments.

COURSE OUTCOMES

1. To develop simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To implement conditional branching, iteration and recursion.
4. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
5. To use arrays, pointers and structures to develop algorithms and programs.

Text books:

1. Schum's Outline of Programming with C by Byron Gottfried, McGraw-Hill
2. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education.
3. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015.
4. Computer Concepts and Programming in C, R.S. Salaria, Khanna Publishing House
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
7. Let Us C By Yashwant P. Kanetkar.
8. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
9. Programming in C by Kochan Stephen G. Pearson Education – 2015.
10. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New AgeInternational Publication.
11. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication.
12. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
13. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
14. Problem Solving and Programming in C, R.S. Salaria, Khanna Publishing House

Programming for Problem Solving Lab

Other Reference: -

1. Use C Open Source Software referring Spoken Tutorial MOOC

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal, Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:

Between 90-100%--------------Print 'A'

80-90%----------------------------Print 'B'

60-80%---------------------------Print 'C'

Below 60%----------------------Print 'D'

11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
22. WAP that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.

23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.

25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.

26. WAP to add and multiply two matrices of order nxn.

27. WAP that finds the sum of diagonal elements of a mxn matrix.

28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.

29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station: string The structure type Time contains two integer members: hour and minute. Maintain a train timetable and implement the following operations:

(i) List all the trains (sorted according to train number) that depart from a particular section.

(ii) List all the trains that depart from a particular station at a particular time.

(iii) List all he trains that depart from a particular station within the next one hour of a given time.

(iv) List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.

31. WAP to compare the contents of two files and determine whether they are same or not.

32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

COURSE OUTCOMES

1. To write programs for arithmetic and logical problems.
2. To translate the algorithms to programs & execution (in C language).
3. To write programs for conditional branching, iteration and recursion.
4. To write programs using functions and synthesize a complete program using divide and conquer approach.
5. write programs using arrays, pointers and structures.

Engineering Graphics and Design

Module 1: Introduction to Engineering Drawing, Orthographic Projections [08]

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Scales – Plain and Diagonal Scales
Principles of Orthographic Projections – Conventions – Projections of Points and Lines inclined to both planes; Projections of planes inclined Planes – Auxiliary Planes.

Module 2: Projections and Sections of Regular Solids [08]

Sections in lined to both the Planes – Auxiliary Views; Simple annotation, dimensioning and scale. Floor plans the include: windows, doors and fixtures such as WC, Both, sink, shower, etc.
Prism, Cylinder, Pyramid, Cone – Auxiliary Vies: Development of surfaces of Right Regular Solids – Prism, Pyramid, Cylinder and Cone.

Module 3: Isometric Projections [08]

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conversions.

Module 4: Computer Graphics [08]

Listing the computer technologies the impact on graphical communication, Demonstration knowledge of the theory of CAD software [such as: The Menu System, Tollbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects: Isometric Views of lines, Planes, Simple and compound Solids];

Set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles:

Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to pater using the print command: orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, surface, and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, Multi view, auxiliary, and section views. Spatial visualization exercises Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling:

Module 5: Demonstration of a simple team design project [08]

Geometry and topology of engineered components: creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

Course Outcomes

1: Understanding of the visual aspects of engineering design
2: Understanding of engineering graphics standards and solid modelling
3: Effective communication through graphics
4: Applying modern engineering tools necessary for engineering practice
5: Appling computer-aided geometric design
6: Analysis of Isometric views
7: Creating working drawings

Suggested Text/ Reference Books:

(i) Bhatt N.D., Panchal V.M. & Ingle P.R. (2014), Engineering Drawing, Charotar Publishing House.
(ii) Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
(iii) Agrawal B. & Agrawal C.M. (2012), Engineering Graphics, TMH Publication
(iv) Engineering Graphics & Design, A.P. Gautam & Pradeep Jain Khanna Publishing House
(v) Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.
(vi) (Corresponding set of) CAD Software Theory and User Manuals.

WORKSHOP PRACTICE

LIST OF EXPERIMENTS

Machine shop:

- Study of machine tools in particular Lathe machine
- Demonstration of different operations on Lathe machine
- Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting.
- Study of Quick return mechanism of Shaper.

Fitting shop:

- Preparation of T-Shape Work piece as per the given specifications.
- Preparation of U-Shape Work piece which contains: Filing, Sawing, Drilling, Grinding.
- Practice marking operations.

Carpentry:

- Study of Carpentry Tools, Equipment and different joints.
- Practice of Cross Half lap joint, Half lap Dovetail joint and Mortise Tenon Joint

Electrical & Electronics

- Introduction to House wiring, different types of cables. Types of power supply, types of motors, Starters, distribution of power supply, types of bulbs, parts of tube light, Electrical wiring symbols.
- Soldering and desoldering of Resistor in PCB.
- Soldering and desoldering of IC in PCB.
- Soldering and desoldering of Capacitor in PCB

Welding:

- Instruction of BI standards and reading of welding drawings.
- Butt Joint
- Lap Joint
- TIG Welding
- MIG Welding

Casting:

- introduction to casting processes

Smithy

- Sharpening any arc and edge.
- Preparing small arc and edge,
- Repair of agricultural implements and power plough, use of power hammer etc.

Plastic Moulding& Glass Cutting

- Introduction to Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes
- Demo of mould preparation
- Practice – Preparation of mould
- Glass cutting

COURSE OUTCOMES

1. Study and practice on machine tools and their operations
2. Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
3. Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
4. Welding and soldering operations
5. Apply basic electrical engineering knowledge for house wiring practice

Text Books:

1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers.
3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010.
4. JeyapoovanT.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.

PROFESSIONAL ENGLISH

Module 1- Basics of Technical English **[08]**

Technical English: Definition; Extent& Coverage; Dimensions; Reading; Skimming; Scanning; Churning & Assimilation; Writing: Methods: Inductive; Deductive; Exposition; Linear; Interrupted; Spatial & Chronological etc; Technical Communication; Approaches: Brevity; Objectivity; Simplicity; Utility & Clarity. **Listening**: Active; Passive; Thinking strategies: Positive & Logical thinking; Speaking: Essentials Nuances & Modes of Speech Delivery.

Module 2- Components of Technical Writing **[08]**

Vocabulary Building: Select words; Concept of word formation; Word formation; Root words from foreign languages & their use in English; Prefixes & Suffixes: Derivatives; Synonyms; Antonyms; Abbreviations. Homophones. One word substitutes; Requisites of Sentences.

Module 3- Basic Technical Writing Skills **[08]**

Forms: Business writing: Principle; Purchase & Sales Letters; Drafts; Official Writing: Official Letter; D.O. Letter; Notices; Agenda; Minutes of Meeting; Sentence Structure; Phrases & Clauses in sentences; Coherence; Unity; Emphasis in Writing; Devices; Use of Writing methods in Documents; Techniques of writing.

Module 4- Common Grammatical Errors & Technical Style **[08]**

Subject-verb agreement; Correct usage: Noun; Pronoun; Agreement; Modifiers; Articles; Prepositions; Cliches; Redundancies; Technical Style: Features; Choice of words; Sentences: Descriptive; Narrative; Expository; Defining & Classifying; Length of paragraph; Writing of Introduction & Conclusion.

Module 5- Presentation Strategies & Oral Communications **[08]**Analysis of locale; Audience; Modulating Style & Content; Speaking with confidence; Kinesics; Paralinguistic features of Voice-Dynamics: Pitch; Intonation; Stress & Rhythm; Conversation & dialogues; Communication at work-place; etc.

COURSE OUTCOMES

1. Students will be enabled to **understand** the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
2. Students would be able to **create** substantial base by the formation of strong professional vocabulary for its application at different platforms and through numerous modes as Comprehension, reading, writing and speaking etc.
3. Students will **apply** it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.

4. Students will be made to **evaluate** the correct & error-free writing by being well-versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

5. Students will **apply** it for practical and oral presentation purposes by being honed up in presentation skills and voice-dynamics. They will apply techniques for developing inter-personal communication skills and positive attitude leading to their professional competence.

Text Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2016, New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.

Reference Books:

1. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. & Distributors, 2009, Delhi.
2. Manual of Practical Communication by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
3. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
4. English Grammar, Composition and Usage by N.K.Agrawal&F.T.Wood, Macmillan India Ltd., New Delhi.
5. Effective Communication Skill, Kulbhusan Kumar, RS Salaria, Khanna Publishing House
6. English Grammar & Composition by Wren & Martin, S.Chand& Co. Ltd., New Delhi.
7. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
8. Personality Development, Harold R. Wallace &L.Ann Masters, Cengage Learning, New Delhi
9. Personality Development & Soft Skills, BarunK.Mitra, Oxford University Press, 2012 New Delhi.
10. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
11. Developing Communication Skills by Krishna Mohan, Meera Bannerji- Macmillan India Ltd. 1990, Delhi.
12. Spoken English- A manual of Speech and Phonetics by R.K.Bansal&J.B.Harrison, Orient Blackswan, 2013, New Delhi.
13. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

of

B. Tech. Civil Engineering
(2nd Year)

[Effective Form session 2014-15]

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NCE-302	Building Materials & Construction	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCE-303	Surveying-I	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Value & Professional Ethics/Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
7	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
8	NCE-352	Building Materials Lab	0	0	2	10	10	20	30	50	1
9	NCE-353	Surveying Lab	0	0	3	10	10	20	30	50	1
10	NCE-354	Building Planning & Drawing	0	0	2	10	10	20	30	50	1
11	NGP-301	NGP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: *Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).*

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credits
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NCE-401	Structural Analysis-I	3	1	0	30	20	50	100	150	4
3	NCE-402	Geo-informatics	3	1	0	30	20	50	100	150	4
4	NCE-403	Hydraulics & Hydraulic Machines	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NCE-404	Engineering Geology	2	1	0	15	10	25	50	75	3
	AUC-002/ AUC-001	*Cyber Security/Human Value & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
7	NCE-451	Structural Analysis Lab	0	0	3	10	10	20	30	50	1
8	NCE-452	Geo-informatics Lab	0	0	3	10	10	20	30	50	1
9	NCE-453	Hydraulics & Machine Lab	0	0	2	10	10	20	30	50	1
10	NCE-455	CBSNT Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	NGP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NME-302: MECHANICS OF SOLIDS **L T P**
3 1 0

UNIT-I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by.Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and & Yσungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI

7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NCE 301 FLUID MECHANICS

L T P
3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,

2. Cengel & Cimbala, ”Fluid Mechanics” TMH, New Delhi.
3. White,F.M. ”Fluid Mechanics” TMH, New Delhi.
4. Munsen et al ,”Fundamental of Fluid Mechanics” Wiley Newyork Ltd
5. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd
6. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student, Education

NCE 351 FLUID MECHANICS LAB

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0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NCE 302 Building Materials & Construction

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4 0

Unit-1

Classificationof building materials, buildingmaterialsandtheirperformance,economicsofthebuildingmaterials.

Stones, Requirement of goodbuildingstone,characteristicsof buildingstonesandtheirtesting.Commonbuildingstones.Methods of preservationofstones.

Bricks:Manufacturing processofclaybricks,classification of clay bricks.Propertiesofclaybricks,testing methods for clay bricks .Problemsofefflorescence&limeburstinginbricks&tiles.

Gypsum:propertiesofgypsumplaster,buildingproducts madeofgypsumandtheiruses.

Lime:Manufactureoflime,classificationsoflimes,propertiesoflime.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses,NaturalandArtificialflyash,Surkhi(burntclaypozzolona),ricehusk andashpozzolona,propertiesandspecificationsforuseinconstruction.

Timber:Classificationandidentificationoftimber,FundamentalEngineering Properties of timber,Defectsintimber,Factorsaffectingstrengthoftimber,Methods ofseasoningand preservationoftimber.Woodbasedproducts.

Asphalt,BitumenandTar:Terminology,specificationsanduses,Bituminous materials.

Unit– II

ChemistryofPlasticsmanufacturingprocess,classification,advantagesof plastics, Mechanical properties and use of plastic in construction.

Paint svarnishesanddistempers, Common constituents, types and desirable properties, Cement paints.

Ferrousmetals,Desirablecharacteristicsofreinforcingsteel.Principlesofcold working. Reinforcings telemechanical and physical propertieschemicalcomposition.Briefdiscussiononpropertiesandusesof Aluminumandlead.

Glass:Ingredients,propertiestypesanduseinconstruction.

InsulatingMaterials:Thermalandsoundinsulatingmaterial,desirableproperties andtypes of insulating materials.

Unit – III

Componentsofbuilding,areaconsiderations,ConstructionPrincipleandMethods forlayout,Dampproofing,antitermitetreatment in buildings,Verticalcirculationmeans :staircases and their types,designandconstruction.

Differenttypesoffloors,andflooringmaterials(Groundfloorandupperfloors).

Bricksandstonemasonaryconstruction.Cavitywallhollowblockconstruction.

Unit- IV

Doors,WindowsandVentilations,Constructiondetails,types of doors and windowsand theirrelative advantages&disadvantages.Types of roofand roof treatments,LintelsandChhajja,

FunctionalefficiencyofBuildings.

Unit-V

NaturalVentilation,WaterSupplyandSanitaryfittings(Plumbing),Electricity.

HeatingVentilation&Airconditioning,MechanicalLiftsandEscalators,Fire Fighting,Acoustics.

Plasteringdifferenttypes,pointing,Distempering,Colourwashing,Paintingetc.

Principles&Methodsofbuildingmaintenance

References

1.SKDuggal:BuildingMaterials,NewAgeInternational
2.P.C.Varghese:BuildingMaterials,PHI

3.P.C.Varghese:BuildingConstruction,PHI
4.B.C.Funmia:ATextBookofBuildingConstruction,LuxmiPublications,Delhi.
5.O.H.Koenisberger:“Manualoftropicalhousingandbuilding”OrientLongman
6.S.P.Aroraatal.,“ATextBookofBuildingConstruction-DhanpatRai&Sons,

NCE-352 BUILDING MATERIALSLAB

LTP Testing of various properties of following as per BIS specifications
003

I.**Cement**

1.Normal Consistency of cement.
2.Initial & final setting time of cement
3.Compressive strength of cement
4.Finenessofcementbyair permeability and Le-chatalier’s apparatus.
5.Soundness of cement.
6.Tensilestrength

II.**Coarse Aggregate**

1.Crushing value of aggregate
2.Impactvalue of aggregate
3.water absorption of aggregate
4.SieveAnalysis of Aggregate
5.Specific gravity &bulk density
6.Grading of aggregates.

III**FineAggregate** :

1.Sieveanalysisofsand
2.Silt content of sand
3.Bulkingofsand

IV **Cement concrete**: Workability tests, compressive strength, Tensile strength

V **Reinforcing Steel :**Tensile and yield strength, Percentage elongation

VI Non destructive testing on concrete

VII Bricks:

1.Waterabsorption.
2.Dimension Tolerances
1Compressive strength
4.Efflorescence

NCE 303 Surveying

L T
2 1

Unit - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors (**2)**

Linear Measurements, Measurement of directions: Reference meridians, bearing and azimuths, Compass, Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control, Electronic Theodolites and Total Station. **(4)**

Unit – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, Automatic level, Digital Level, Vertical Control **(4)**

Contouring: methods and uses, Principles of stadia systems, subtense bar and tangential methods **(2)**

Unit – III

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, triangulation field work **(5)**

Plane table surveying, equipments, methods, resection by three point problem **(2)**

Unit – IV

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves **(5)**

References

1. B. C. Punamia et al: Surveying Vol. I, II
2. A. M. Chandra: Plane Surveying, Higher Surveying
3. S K Duggal: Surveying Vol. I, II
4. R Subramanian : Surveying & Leveling , Oxford University Press
5. C Venkatramaih : Text Book of Surveying , University Press
6. W. Schofield, Mark Breach, Engineering Surveying
7. Charles D. Ghilani, Elementry Surveying

NCE 353 SURVEYING LAB

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0 0 3

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical levelling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method

NCE-354BUILDING PLANNING & DRAWINGLAB.

LTP
003

Drafting of following Using Any CAD software

1.Symbols used in Civil Engineering drawing , Types of Masonry Bonds

*2.*Doors, Windows and staircases.

*3.*Plumbing & Electrical fitting drawings

*4.*Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation & sectional elevation) elevation, plumbing & electrical fillings in out.

*5.*Preparation of Layout plans of different types of Civil Engg. Projects.Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.

NCE-401STRUCTURALANALYSIS–I

LTP
310

Unit–I :

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom per node, Static and Kinematic Indeterminacy for beams, trusses and building frames.[03]
Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.[05]

Unit– II

Rolling loads and influence line diagrams for beams and trusses, Absolute maximum bending moment and shear force.
Muller-Breslau's principal & its applications for determinate structures[08]

Unit – III

Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged parabolic arch, spandrel
braced arch, moving load & influence lines for three hinged arch.[08]

Unit – IV

Strain Energy of deformable systems, Maxwell's reciprocal &Betti's theorem, Castigliano's first theorem, Calculations of deflections: Moment area method, unit load method& Conjugate beam methods for statically determinate beams ,truss and frames.[08]

Unit–V

Unsymmetrical bending in beams, location of neutral axis, computation of stresses and deflection,
Shear Centre its location for common structural sections.[05]
Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.[03]

References

1.Hibbler ," Structural Analysis ", Pearson Education
2.T S Thandavmorthy ," Analysis of Structures ", Oxford University Press
3.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
*4.*Reddy,C.S., "Basic Structural Analysis", Tata McGraw Hill.

5.Jain,O.P.and Jain, B.K., “Theory & Analysisof Structures ”. Vol.I & II Nem Chand.
6.Vazirani&Ratwani et al ,” Analysis of Strcuctures “ , Khanna Publishers
7.Coates,R.C.,Coutie,M.G. & Kong, F.K., “Structural Analysis”, English Language BookSociety & Nelson, 1980.

NCE-451STRUCTURALANALYSISLAB

LTP
003 Following experiments to be performed

1.To determine Flexural Rigidity (EI) of a given beam
2.To verify Maxwell’s Reciprocal theorem.
3.To find horizontal thrust in a three-hinged arch and to draw influence line diagramsfor Horizontal Thrust end Bending moment.
4.To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5.To find deflection of curved members.
6.To find bar forces in a three members structural frames with pin jointed bar
7.To find Critical load in Struts with different end conditions.
8.To find deflections in Beam having unsymmetrical bending.

NCE 402 GEOINFORMATICS

L T P
3 1 0

Unit - I
Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation, Introduction to Digital Photogrammetry.
Unit - II
Remote Sensing: Physics of remote sensing, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC
Unit - III
Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing
Unit - IV
Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications
Unit - V
Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Higher Surveying
3. T M Lillesand et al: Remote Sensing & Image Interpretation
4. B. Bhatta: Remote Sensing & GIS
5. M Anjireddy : Remote Sensing & GIS , BS Publications
6. A. E Rabbany: Introduction to GPS
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad.

NCE 452 GEOINFORMATICS LAB

L T P
0 0 3

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

NCE 403 Hydraulics & Hydraulic Machines

L T P
3 1 0

Unit - I

Difference between open channel flow and pipe flow, geometrical parameters of a channel.

Continuity equation for steady and unsteady flow.

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit – II

Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.

Unit - III

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.

Unit - IV

Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds.

Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.

Unit - V

Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References :

1.Chow,V.T."Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

NCE 453 Hydraulics & Hydraulic Machines LAB

L T P
0 0 3

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc

NCE 454 COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

L	T	P
0	0	3

Write Programs in ‘C’ Language:

1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
2. To implement Newton’s Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel’s, Sterling’s and Evertt’s Interpolation formula
4. To implement Numerical Differentiations & Integration
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness
7. Linear correlation and regression

NCE-404 Engineering Geology

L T P
2 1 0

UNIT I – Study of Rocks:

Introduction and importance of Geological knowledge. Rocks: their origin, structure and texture. Classification of igneous, sedimentary and metamorphic rocks and their suitability as engineering materials, Weathering and erosion of rocks, Stratification, Lamination bedding. Outcrop-its relation to topography. Dip and Strike of bed. Overlap, outlier and Inlier. Building stones and their engineering properties. **10**

UNIT I I- Study of Minerals:

Physical properties of minerals. Detailed study of certain rock forming minerals. Alkali aggregate reaction. Grouting. Pozzolonic materials. **10**

UNIT III- Rock Deformation & Earthquake

Folds, Faults, Joints and unconformities: Their classification, causes and relation to engineering behavior of rock masses. Landslides, its causes and preventive measures. Earthquake, its causes, classification, seismic zones of India and its geological consideration. **10**

UNIT IV- Geophysical Exploration and Geological Investigation:

Geophysical exploration methods for sub-surface structure. Underground water and its origin. Aquifer & Aquiclude. Artesian wells. Underground provinces and its role as geological hazard. Site selection for dam, reservoir, tunnel, bridge and highway. **10**

References:

1. D Venkat Reddy: Engg. Geology, Vikas Publication
2. Tony Waltham: Foundations of Engg. Geology, Spon Press
3. Tony Waltham: Foundations of Engineering Geology, SPON Press.
4. D Venkat Reddy: Engineering Geology, Vikas Publishing House Pvt. Ltd.
5. J M Treteth: Geology of Engineers, Princeton, Von. Nostrand.
6. K V G K Gokhale: Text book of Engineering Geology, B S Publication.
7. Prabin Singh: Engg. and General Geology, Katson Publishing House.
8. D S Arora: Geology for Engineers, Mohindra Capital Publishers, Chandigarh.
9. F G Bell: Fundamental of Engineering Geology, B S Publication.
10. Leggot R F: Geology and Engineering, McGraw Hill, New York.
11. P K Mukerjee: A Text book of Geology, Calcuta Word Publishers.
12. B S Sathya Narayanswami: Engineering Geology, Dhanpat Rai & Co.
13. Prakash Rao : Engineering Geology, Nirali Prakashan, Pune.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

LUCKNOW

Study & Evaluation Scheme with Syllabus

for

B.Tech. Second Year

Civil Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
4.	RCE301	Building Materials & Construction	3-1-0	70	20	10	100	4
5.	RCE302	Surveying	3-0-0	70	20	10	100	3
6.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
7.	RCE351	Building Materials Lab	0-0-2	50	30	20	100	1
8.	RCE352	Surveying Lab	0-0-2	50	30	20	100	1
9.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
10.	RCE354	Computer Based Statistical & Numerical Techniques Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	RCS405	Data Structures	3-0-0	70	20	10	100	3
4.	RCE401	Hydraulics & Hydraulic Machines	3-0-0	70	20	10	100	3
5.	RCE402	Geoinformatics	3-0-0	70	20	10	100	3
6.	RCE403	Structural Analysis	3-1-0	70	20	10	100	4
7.	RCE452	Geoinformatics Lab	0-0-2	50	30	20	100	1
8.	RCE453	Structural Analysis Lab	0-0-2	50	30	20	100	1
9.	RCE454	Building Planning & Drawing Lab	0-0-2	50	30	20	100	1
10.	RCE455	Hydraulics & Machine Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Industrial Training:

Students will go for Industrial Training of 8-10 weeks in total in two parts (Industrial Training-1 & Industrial Training-2) which is to be evaluated in VII semester after submission of separate training report for each part.

Industrial Training-1: Students will go to Industrial Training-1 of 4 weeks after IV semester which will be evaluated in VII semester.

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

RCE301: BUILDING MATERIALS & CONSTRUCTION

UNIT I

Scope of Study of building Materials: building materials and their performance, economics of the building materials. **Stones:** Requirement of good building stone, characteristics of building stone sand their testing. Common building stones. Methods of preservation of stones. **Bricks**: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. **Gypsum**: properties of gypsum plaster, building products made of gypsum and their uses. **Lime**: Manufacture of lime, classifications of limes, properties of lime. **Cement**: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement. **Cement Concrete**: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete. **Pozzolona**: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. **Timber**: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor saffecting strength of timber, Methods of seasoning and preservation of timber. Wood based products. **Asphalt:** Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

UNIT II

Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. **Paint svarnishes and distempers:** Common constituents, types and desirable properties, Cement paints. **Ferrous metals:** Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcings telemechanical and physical Properties chemical composition. Brief discussion on properties and uses of Aluminum and lead. **Glass**: Ingredients, properties types and use in construction. **Insulating Materials**: Thermal and sound insulating material, desirable properties and types.

UNIT III

Buildings: Components of building, area considerations, Construction Principle and Methods for layout, Damp proofing, antitermite treatment in buildings, Vertical circulation means: stair cases and their types, design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks and stone masonary construction. Cavity wall & hollow block construction.

UNIT IV

Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning.

UNIT V

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance.

References:

1. SK Duggal, “Building Materials” New Age International
2. Purushothama Raj, “Building Construction Materials & Techniques” Pearson Edu.
3. PC Varghese, “Building Materials” PHI
4. Rangwala, “Building Materials” Charotar Publishing House.
5. Sushil Kumar, “Building Construction” Standard Publisher.
6. Domone, “Construction Materials” 4/e, CRC Press Taylor & Francis Group.
7. Adams, “Adams’ Building Construction Adams” CRC Press Taylor & Francis Group.
8. BC Punmia, “Building Construction” Laxmi Publication.
9. Jha & Sinha, “Building Construction” Khanna Publishers
10. Sahu, “Building Materials and Construction” Mc Grew Hill Education
11. Deodhar, “Civil Engineering Materials” Khanna Publishers
12. Mehta, “Building Construction Principles, Materials & Systems” 2/e, Pearson Education Noida.
13. Sandeep Mantri, “Practical building Construction and its Management” Satya Publisher, New Delhi.

RCE302: SURVEYING

UNIT I

Surveying: definition, divisions, classification and principles of surveying. Scales: plain, vernier, diagonal, plan and map. Accuracy and errors: definitions, sources and kinds of errors, application of probability for computation of errors, laws of weights.

UNIT II

Linear measurement: chain and tape surveying, types of chain and tape, ranging, obstacles and tape correction. Compass surveying: Measurement of directions, Reference meridians, bearing and azimuths, local attraction. Theodolite survey: Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control,working of Electronic Theodolites.

UNIT III

Leveling: Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, use of Automatic level, Digital Level, Vertical Control. Contouring: contours, contour interval, horizontal equivalent, characteristics, methods and interpolation, use to prepare profiles. Tachometry: Principles of stadia systems, subtense bar and tangential methods.

UNIT IV

Traversing and triangulation: Principles of traversing by compass and theodolite, computations of traverse coordinates, omitted measurements, Principles and classification of triangulation systems, strength of figures, satellite stations, and triangulation field work. Introduction to modern surveying Instruments /Techniques like total station.

UNIT V

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves. Survey Layout for culverts, canals, bridges, road/railway alignment and buildings.

References:

1. Schofield, “Engineering Surveying” 6/e, CRC Press Taylor & Francis Group.
2. BC Punamia et al: Surveying Vol. I, II, Laxmi Publication
3. Bannister, “Surveying” 7/e, Pearson Education, Noida.
4. AM Chandra: Plane Surveying, Higher Surveying, Narosa Pub.
5. AK Dey Plain Survey, S Chand
6. SK Duggal: Surveying Vol. I, II.
7. R Subramanian : Surveying & Leveling , Oxford University Press
8. C Venkatramaih : Text Book of Surveying , University Press
9. Charles D. Ghilani, Elementary Surveying Pearson Education
10. R. Agor, “Surveying and Levelling” Khanna Publishers.

RCE303: FLUID MECHANICS

UNIT I

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

UNIT III

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control.

UNIT V

Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance.

References :

1. Hibbler, "Fluid Mechanicsin SI Units" 1/e Pearson Education, Noida.
2. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,
3. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
4. Katz, "Introductory Fluid Mechanics" Cambridge University Press
5. Pnueli & Gutfinger, "Fluid Mechanics" Cambridge University Press
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida
8. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor & Francis Group.
9. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor & Francis Group.
10. AK Jain "Fluid Mechanics" Khanna Publication.
11. White,F.M. "Fluid Mechanics" TMH, New Delhi.
12. Munsen et al , "Fundamental of Fluid Mechanics" Wiley Newyork Ltd

13. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd
14. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student.
15. RK Bansal “Fluid Mechanics and Hydraulic Machines” Laxmi Publication
16. Jagdish Lal “Fluid Mechanics”
17. N Narayan Pillai “ Principles of Fluid Mechanics & Fluid Machines” Universities Press.
18. Esposito, Fluid Power & Applications” 7/e Pearson Education, Noida.
19. DR Malhotra & Malhotra, “Fluid Mechanics Hydraulics & Hydraulic Machines” Satya Prakashan, New Delhi.

RCE351/ RCE451: BUILDING MATERIALS LAB

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier’s apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

RCE352: SURVEYING LAB

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method.
10. To plot contour map of given area.

RCE353: FLUID MECHANICS LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

RCE354: COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES LAB

Write computer program in C/C^{++} /visual basic for mathematical and engineering solutions.

1. Write a code for finding out the root of the algebraic and transcendental equations using Newton-Raphson's iterative method.
2. Write a computer program for inversion of matrix.
3. Write a computer program for Eigen value solution of matrix.
4. Write a computer program for Runge Kutta fourth order method (RK4) to solve ordinary differential equation.
5. Write a computer program to find the engineering properties of I and channel sections.
6. Write a computer program to solve simultaneous linear equations.
7. Write the program to implement the Gauss forward interpolation formula and back ward interpolation formula.
8. Write code for one dimensional heat equation and one dimensional fluid flow problem (boundary value problem).

RCE401: HYDRAULICS & HYDRAULIC MACHINES

UNIT I

Introduction : Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critcal and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections.

UNIT II

Energy-Depth relationship: Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods.

UNIT III

Rapidly varied flow: hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds. Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

UNIT IV

Impulse momentum equation- Impact of Jets-plane and curved- stationary and moving plates.
Pumps: Positive displacement pumps - reciprocating pumps - operating principles -slip - indicator diagram - separation- air vessels. centrifugal pumps - operation - velocity triangles - performance curves - Cavitation - Multi staging - Selection of pumps.

UNIT V

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

References:

1. Chow,V.T. "Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication
6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.
7. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
8. AK Jain "Fluid Mechanics" Khanna Publication.
9. Houghtalen, "Fundamentals of Hydraulics Engineering Systems" 4/e Pearson Education, Noida.

RCE402: GEOINFORMATICS

UNIT I

Photogrammetric Survey, basic principles, elevation of a point, determination of focal length of lens, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, scale of a tilted photograph, tilt distortion, relief displacement of a tilted photograph, combined effects of tilt and relief, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope parallax, parallax in aerial stereoscopic views, parallax equations. Photogrammetry – analog, analytical and digital photogrammetry.

UNIT II

Remote Sensing, Introduction, concepts and physical basis of Remote Sensing, Electromagnetic spectrum, radiation laws, atmospheric effects, image characteristics. Remote sensing systems; sources of remote sensing information, spectral quantities spectral signatures and characteristics spectral reflectance curves for rocks, soil, vegetation and water. Introduction to Aerial and space borne platforms. Optical, thermal and microwave sensors and their resolution, salient features of some of operating Remote Sensing satellites.

UNIT III

Digital image processing: introduction, image rectification and restoration, image enhancement, image transformation, manipulation, image classification, fusion. Applications of remote sensing to civil engineering.

UNIT IV

GIS system: Definition terminology and data types, basic components of GIS software, data models, data acquisition, both raster based and vector based data input and data processing and management including topology, overlaying and integration and finally data product and report generation. GIS applications in civil engineering.

UNIT V

Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications.

References:

1. Sateesh Gopi, R Sathkumar & N Madhu “Advanced Surveying GIS & Remote Sensing” Pearson Education.
2. Kang Tshung Chang “Introduction of Geographic Information Systems” TMH.
3. Campbell, “Introduction to Remote Sensing” 3/e, CRC Press Taylor & Francis Group.
4. Chen, “Signal and Image Processing for Remote Sensing” CRC Press Taylor & Francis Group.
5. A M Chandra: Higher Surveying Narosa Pub.
6. B C Punamia: Higher Surveying Laxmi Publication
7. T M Lillesand et al: Remote Sensing & Image Interpretation
8. R. Agor, “Advanced Surveying” Khanna Publishers.
9. B. Bhatta: Remote Sensing & GIS TMH.
10. M Anjireddy: Remote Sensing & GIS, BS Publications
11. Narayan Panigrahi “Geographical Information Science” Universities Press.

12. N K Agarwal: Essentials of GPS, Spatial Networks: Hyderabad.
13. George Joseph “Fundamental of Remote Sensing” Universities press.
14. GS Srivastava “An Introduction to Geoinformatics” TMH.
15. Ahmed EI Rabbany, “Introduction to GPS The Global Positioning System” Artech House, Boston.
16. Chor Pang Lo, “Concepts & Techniques of Geographic Information Systems” 2/e, Pearson Education

RCE403: STRUCTURAL ANALYSIS

UNIT I
Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom, Static and Kinematic Indeterminacy for beams, trusses and building frames. Analysis of cables with concentrated and continuous loadings, Effect of Temperature upon length of cable.

UNIT II
Classification of Pin jointed determinate trusses, Analysis of determinate plane trusses (compound and complex). Method of Substitution, Method of tension coefficient for analysis of plane trusses.

UNIT III
Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's theorems, Calculations of deflections: Strain Energy Method, unit load method& for statically determinate beams, frames and trusses. Deflection of determinate beams by Conjugate beam method.

UNIT IV
Rolling loads and influence line diagrams for determinate beams and trusses, Absolute maximum bending moment and shear force. Muller-Breslau's principal & its applications for determinate structures.

UNIT V
Arches, Types of Arches, Analysis of three hinged parabolic and circular Arches. Linear arch, Eddy's theorem, spandrel braced arch, moving load & influence lines for three hinged parabolic arch.

References

1. Hibbler, "Structural Analysis", Pearson Education
2. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
3. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
4. T S Thandavmorthy, "Analysis of Structures", Oxford University Press 5.Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
5. Temoshenko & Young "Theory of Structure" Tata Mc Grew Hill.
6. Reddy, CS, "Basic Structural Analysis", Tata McGraw Hill.
7. Jain, OP and Jain, BK, "Theory & Analysis of Structures ". Vol.I & II Nem Chand.
8. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
9. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
10. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
11. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
12. S Ramamurtham "Theory of Structure" Dhanpat Rai.
13. Devdas Menon "Advanced Structural Analysis" Narosa
14. Wang, CK, "Intermediate Structural Analysis", Tata Mc-Graw Hill.
15. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
16. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis

Group.
17. Bibek Kumar Mukherjee, “Theory and Analysis of Structures” Satya Prakashan, New Delhi.
18. Jacques Heyman, “Structural Analysis” Cambridge University Press.

RCE452: GEOINFORMATICS LAB

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.

RCE453: STRUCTURAL ANALYSIS LAB

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell’s Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

RCE454: BUILDING PLANNING & DRAWING LAB

Drawing and drafting of following with CAD software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

RCE455: HYDRAULICS & MACHINE LAB

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. SECOND YEAR

(CIVIL ENGINEERING)

(Effective from session 2019-20)

THIRD SEMESTER **CIVIL ENGINEERING** **SESSION 2019-20**

S.No	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/KAS303	Engineering Science Course/Maths III	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE301	Technical Communication/ Universal Human Values	2 / 3	1 / 0	0 / 0	30	20	50		100		150	3
3	KCE301	Engg. Mechanics	3	1	0	30	20	50		100		150	4
4	KCE302	Surveying and Geomatics	3	1	0	30	20	50		100		150	4
5	KCE303	Fluid Mechanics	3	0	0	30	20	50		100		150	3
6	KCE351	Building Planning & Drawing Lab	0	0	2				25		25	50	1
7	KCE352	Surveying and Geomatics Lab	0	0	2				25		25	50	1
8	KCE353	Fluid Mechanics Lab	0	0	2				25		25	50	1
9	KCE354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/ Python Programming	2	0	2	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										950	22

*The Mini Project or Internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER - IV

S.No	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS403/ KOE041-48	Maths III/ Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/Technical Communication	3 / 2	0 / 1	0 / 0	30	20	50		100		150	3
3	KCE401	Materials, Testing & Construction Practices	3	0	0	30	20	50		100		150	3
4	KCE402	Introduction to Solid Mechanics	3	1	0	30	20	50		100		150	4
5	KCE403	Hydraulic Engineering and Machines	3	1	0	30	20	50		100		150	4
6	KCE451	Material Testing Lab	0	0	2				25		25	50	1
7	KCE452	Solid Mechanics Lab	0	0	2				25		25	50	1
8	KCE453	Hydraulics & Hydraulic Machine Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming/Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										900	21

ENGINEERING MECHANICS (L-T-P 3-1-0) Credit – 4

<u>Course Outcomes: At the end of this course the student will be able to-</u>

1. Use scalar and vector analytical techniques for analyzing forces in statically determinate structures
2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.
3. Apply basic knowledge of mathematics and physics to solve real-world problems.
4. Understand basic dynamics concepts – force, momentum, work and energy;
5. Understand and be able to apply Newton's laws of motion;

UNIT - I*t*Introduction to Engineering Mechanics*:* Force Systems, Basic concepts, Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Applications; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems.

Friction*:* Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack; [8 Hours]

UNIT- II*t* Centroid and Centre of Gravity*,* Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. [8 Hours]

UNIT - III*t* Basic Structural Analysis*,* Equilibrium in three dimensions; Analysis of simple trusses by method of sections & method of joints, Zero force members, Simple beams and support reactions. [8 Hours]

UNIT - IV*t* Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). [8 Hours]

UNIT - V*t*Introduction to Kinetics of Rigid Bodies*,* Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation

Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, Applications of energy method for equilibrium, Stability of equilibrium. [8 Hours]

Books and References

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill

3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press

5. Shanes and Rao (2006), Engineering Mechanics, Pearson Education,

6. Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education

7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics

8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications

9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

10. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

11. Strength of Materials by Timoshenko and Yσungs, East West Press.

12. Textbook of Applied Mechanics-Dynamics and Statics by Prasad I.B, Khanna Publications.

SURVEYING & GEOMATICS **(L-T-P 3-1-0)** **Credit – 4**

Course Outcomes: At the end of this course the student will be able to-

1. Describe the function of surveying and work with survey instruments, take observations, and prepare plan, profile, and cross-section and perform calculations.
2. Calculate, design and layout horizontal and vertical curves.
3. Operate a total station and GPS to measure distance, angles, and to calculate differences in elevation. Reduce data for application in a geographic information system.
4. Relate and apply principles of photogrammetry for surveying.
5. Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.

UNIT - I

Introduction to Surveying: Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and it methods, Meridians and Bearings, Methods of leveling, Booking and reducing levels, Reciprocal leveling, distance of visible horizon, Profile leveling and cross sectioning, Errors in leveling; Introduction to methods of plane table surveying; *Contouring:* Characteristics, methods, uses, computation of areas and volumes. *Theodolite survey:* Instruments, Measurement of horizontal and vertical angle; Methods of horizontal and vertical control, *Triangulation:* Figures or systems, Signals, Satellite station, Baseline and its importance, corrections, *Trigonometric leveling*: Accessible and inaccessible objects. [8 Hours]

UNIT - II

Curves: Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves. [8 Hours]

UNIT - III

Modern Field Survey Systems: Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems- Segments, working principle, errors and biases. *Geographic Information System:* Concepts and data types, data models, data acquisition. GIS applications in civil engineering. [8 Hours]

UNIT - IV

Photogrammetric Survey: basic principles, aerial camera, scale of a vertical photograph, relief displacement of a vertical photograph, height of object from relief displacement, flight planning for aerial photography, selection of altitude, interval between exposures, crab and drift, stereoscope and stereoscopic views, parallax equations. Introduction to digital photogrammetry. [8 Hours]

UNIT - V

Remote Sensing: Concepts and physical basis of Remote Sensing, Electromagnetic spectrum, atmospheric effects, image characteristics. Remote sensing systems, spectral signatures and characteristics spectral reflectance curves. Salient features of some of Remote Sensing satellites missions. *Digital image processing:* Introduction, image rectification and restoration, image enhancement, image transformation, image classification. Applications of remote sensing to civil engineering. [8 Hours]

Books and References:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011

3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010

4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.

6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.

7. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication

8. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science

9. Ghosh SK: Digital Image Processing, Alpha Science

10. Lillesand T M et al: Remote Sensing & Image Interpretation, John Wiley & Sons

11. Bhatta B: Remote Sensing and GIS, Oxford University Press, 2008

FLUID MECHANICS (L-T-P 3-0-0) Credit – 3

Course Outcomes: At the end of this course the student will be able to-

1. Understand the broad principles of fluid statics, kinematics and dynamics
2. Understand definitions of the basic terms used in fluid mechanics
3. Understand classifications of fluid flow
4. Apply the continuity, momentum and energy principles
5. Apply dimensional analysis

UNIT I Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density height relationship, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. [8 Hours]

UNIT II Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, path lines, streak lines, stream tube, continuity equation for 1-D, 2-D and 3-D flows, circulation, stream function and velocity potential function. [8 Hours]

UNIT III Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks. [8 Hours]

UNIT IV Equation of motion for laminar flow through pipes, Stokes' law, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, displacement, momentum and energy thickness. Application of momentum equation. Laminar boundary layer, turbulent boundary layer, laminar sub-layer, separation and its control. Vortex Flow: Free & Forced. [8 Hours]

UNIT V Drag and lift, drag on a sphere, aerofoil, Magnus effect, Similarity Laws; geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance. Introduction to Computational Fluid Dynamics (CFD). [8 Hours]

Books and References

1. Hibbler, "Fluid Mechanics in SI Units" 1/e Pearson Education, Noida.

2. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd,

3. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.

4. Katz, "Introductory Fluid Mechanics" Cambridge University Press

5. Pnueli & Gutfinger, "Fluid Mechanics" Cambridge University Press

6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.

7. Gupta, "Fluid Mechanics & Hydraulic Machines" Pearson Education, Noida

8. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor & Francis Group.

9. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor & Francis Group.

10. AK Jain “Fluid Mechanics” Khanna Publication.

11. White,F.M. “Fluid Mechanics” TMH, New Delhi.

12. Munsen et al , “Fundamental of Fluid Mechanics” Wiley Newyork Ltd

13. Garde, R.J., “ Fluid Mechanics”, SciTech Publications Pvt. Ltd

14. I.H. Shames, “Mechanics of Fluids”, McGraw Hill, Int. Student.

15. RK Bansal “Fluid Mechanics and Hydraulic Machines” Laxmi Publication

16. Jagdish Lal “Fluid Mechanics”

17. N Narayan Pillai “ Principles of Fluid Mechanics & Fluid Machines” Universities Press.

18. Esposito, Fluid Power & Applications” 7/e Pearson Education, Noida.

19. DR Malhotra & Malhotra, “Fluid Mechanics Hydraulics & Hydraulic Machines” Satya Prakashan, New Delhi.

BUILDING PLANNING & DRAWING LAB (L-T-P 0-0-2) Credit – 1

Drawing and drafting of following with CAD/BIM software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning and Drawings of Residential building of 1 room set (plan and section).
7. Planning and drawing of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting

SURVEYING & GEOMATICS LAB (L-T-P 0-0-2) Credit – 1

1. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
2. To find out reduced levels of given points using Auto/dumpy level.
3. To study parts of a Vernier and electronic theodolite and measurement of horizontal and vertical angle.
4. To measure horizontal angle between two objects by repetition/reiteration method.
5. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical leveling by taking observations in single vertical plane.
6. To set out a simple circular curve by Rankine's method.
7. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles, coordinates and area of a land parcel.
8. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
9. Visual Interpretation of standard FCC (False colour composite).
10. Digitization of physical features on a map/image using GIS software.
11. Coordinates measurement using GPS.

FLUID MECHANICS LAB **(L-T-P 0-0-2)** **Credit – 1**

Note: Students will perform minimum 10 experiments from the following:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. Verification of Bernoulli's Theorem
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement, sudden contraction and losses in bend.
13. Flow Visualization -Ideal Flow
14. To make studies in Wind Tunnel (Aerofoil and circular cylinder).

Materials, Testing & Construction Practices (L-T-P 3-0-0) Credit – 3

Course Outcomes: At the end of this course the student will be able to-

1. Identify various building materials and to understand their basic properties.

2. Understand the use of non-conventional civil engineering materials.

3. Study suitable type of flooring and roofing in the construction process.

4. Characterize the concept of plastering, pointing and various other building services.

5. Exemplify the various fire protection, sound and thermal insulation techniques, maintenance and repair of buildings.

UNIT I Scope of Study of building Materials: building materials and their performance, economics of the building materials.

Stones: Requirement of good building stone, characteristics of building stone sand their testing. Common building stones.

Bricks: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks. Problems of efflorescence & lime bursting in bricks & tiles. Different types of bricks.

Gypsum: properties of gypsum plaster, building products made of gypsum and their uses.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement.

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi(burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction. Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factor affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products.

Asphalt: Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

[8 Hours]

UNIT II Plastics: classification, advantages of plastics, Mechanical properties and use of plastic in construction. Paints, varnishes and distempers: Common constituents, types and desirable properties, Cement paints. Ferrous metals: Desirable characteristics of reinforcing steel. Principles of cold working. Strength ,Telemechanical, physical Properties and chemical composition. Brief discussion on properties and uses of Aluminum and lead. Glass: Ingredients, properties types and use in construction. Insulating Materials: Thermal and sound insulating material, desirable properties and types. [8 Hours]

UNIT III Building Construction: Components of building area considerations, Construction Principle and Methods for layout, Damp proofing, anti termite treatment in buildings, Vertical circulation: stair cases and their types and planning. Different types of floors, and flooring materials .Bricks and stone masonry construction. Cavity wall & hollow block construction.

[8 Hours]

UNIT IV Doors and Windows: Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintel sand Chhajja, Principles of building Planning. [8 Hours]

UNIT V Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electric Fittings. Heating Ventilation & Air conditioning (HVAC), Mechanical Lifts and Escalators, Fire Fighting and Fire Protection of Buildings. Acoustics. Plastering and its types, pointing, Distempering, Colour washing, Painting etc. Principles & Methods of building maintenance. [8 Hours]

Books and References

1. SK Duggal, "Building Materials" New Age International
2. Purushothama Raj, "Building Construction Materials & Techniques" Pearson Edu.
3. PC Varghese, "Building Materials" PHI
4. Rangwala, "Building Materials" Charotar Publishing House.
5. Sushil Kumar, "Building Construction" Standard Publisher.
6. Domone, "Construction Materials" 4/e, CRC Press Taylor & Francis Group.
7. Adams, "Adams' Building Construction Adams" CRC Press Taylor & Francis Group.
8. BC Punmia, "Building Construction" Laxmi Publication.
9. Jha & Sinha, "Building Construction" Khanna Publishers
10. Sahu, "Building Materials and Construction" Mc Grew Hill Education
11. Deodhar, "Civil Engineering Materials" Khanna Publishers
12. Mehta, "Building Construction Principles, Materials & Systems" 2/e, Pearson Education Noida.
13. Sandeep Mantri, "Practical building Construction and its Management" Satya Publisher, New Delhi.
14. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros.
15. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO etc.
16. Chudley, R. Greeno, Building Construction Handbook, Butterworth

INTRODUCTION TO SOLID MECHANICS (L-T-P 3-1-0) Credit – 4

<u>Course Outcomes: At the end of this course the student will be able to-</u>

1. Describe the concepts and principles of stresses and strains
2. Analyze solid mechanics problems using classical methods and energy methods
3. Analyze structural members subjected to combined stresses
4. Calculate the deflections at any point on a beam subjected to a combination of loads
5. Understand the behavior of columns, springs and cylinders against loads.

UNIT I Simple stress and strains:

Concept of stress and strain, types of stresses and strains, Hook's law, stress and strain diagram for ductile and brittle metal. Lateral strain, Poission ratio, volumetric strain, elastic moduli and relation between them. Bar of varying cross section, composite bar and temperature stress. Strain energy for gradual, sudden and impact loading.

Compound stress and strains:

Normal stress and strain, shear stress and strain, stresses on inclines sections, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law-3D, Theories of failure and factor of safety.

[8 Hours]

UNIT II Shear force and bending moment diagrams

Shear force (SF) and Bending moment (BM) diagrams for simply supported, cantilevers, overhanging and fixed beams. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads. [8 Hours]

UNIT III Flexural Stresses-Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections. [8 Hours]

UNIT IV Deflection of Beams: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules. [8 Hours]

UNIT V Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs.

Thin cylinders, Thick cylinders & Spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders. [8 Hours]

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.

2. Mechanics of material by Gere, Cengage Learning

3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA

4. Strength of Materials by Pytel and Singer, Harper Collins

5. Strength of Materials by Ryder, Macmillan.

6. Strength of Materials by Timoshenko and Yσungs, East West Press.

7. Introduction to Solid Mechanics by Shames, Pearson

8. Mechanics of material by Pytel, Cengage Learning

9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA

10. Strength of Materials by Jindal, Pearson Education

11. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

12. Kazmi, S. M. A., “Solid Mechanics” TMH, Delhi, India.

HYDRAULIC ENGINEERING & MACHINES (L-T-P 3-1-0) Credit – 4

Course Outcomes: At the end of this course the student will be able to-

1. Apply their knowledge of fluid mechanics in addressing problems in open channels.
2. Solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
3. Have knowledge in hydraulic machineries like pumps and turbines.

UNIT I Introduction : Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels critical, sub-critical and super-critical type of flows. Critical depth, concepts of specific energy and specific force. Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound sections. [8 Hours]

UNIT II Energy-Depth relationship: Application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions. Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods. Measurments of discharge & velocity – Venturi flume, Standing wave flume, Parshall flume, Broad crested weir, Current meter and Floats. [8 Hours]

UNIT III Rapidly varied flow: Hydraulic jump; Evaluation of the jump elements in rectangular channels on horizontal and sloping beds, energy dissipater, open channel surge, celerity of the gravity wave, deep and shallow water waves. [8 Hours]

UNIT IV Impulse momentum equation- Impact of Jets-plane and curved- stationary and moving plates. Pumps: Positive displacement pumps - reciprocating pumps , centrifugal pumps, operation, velocity triangles, performance curves, Cavitation, Multi staging, Selection of pumps.

[8 Hours]

UNIT V Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves. [8 Hours]

Books and References

1. Chow,V.T. "Open Channel hydraulics" McGraw Hill Publication

2. Subramanya, K., Flow through Open Channels, TMH, New Delhi

3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi

4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press

5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

6. Modi & Seth "Hydraulics & Fluid Mechanics" Standard Publications.

7. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication

8. AK Jain "Fluid Mechanics" Khanna Publication.

9. Houghtalen, "Fundamentals of Hydraulics Engineering Systems" 4/e Pearson Education, Noida

MATERIAL TESTING LAB **(L-T-P 0-0-2)** **Credit – 1**

Testing of various properties of following materials as per BIS specifications

I. Cement

1. Normal Consistency of cement.
2. Initial & final setting time of cement
3. Compressive strength of cement
4. Fineness of cement by air permeability and Le-chatalier's apparatus.
5. Soundness of cement.
6. Tensile strength

II. Coarse Aggregate

1. Water absorption of aggregate
2. Sieve Analysis of Aggregate
3. Specific gravity &bulk density
4. Grading of aggregates.

III Fine Aggregate:

1. Sieve analysis of sand
2. Silt content of sand
3. Bulking of sand

IV Bricks:

1. Water absorption.
2. Dimension Tolerances
3. Compressive strength
4. Efflorescence

SOLID MECHANICS LAB (L-T-P 0-0-2) Credit – 1

Note: Students will perform minimum 10 experiments from the following:

1._Tension test on Mild Steel
2. Bending tests on simply supported beam and Cantilever beam.
3. Determination of torsion and deflection,
4. Measurement of forces on supports in statically determinate beam,
5. Determination of shear forces in beams,
6. Determination of bending moments in beams,
7. Measurement of deflections in statically determinate beam.
8. To determine Flexural Rigidity (EI) of a given beam
9. To find deflection of curved members.
10. To find Critical load in Struts with different end conditions.
11. Hardness Test (Brinnel's and Rockwell)
12. Impact test (Charpy and IZOD)

Hydraulics & Hydraulic Machine Lab (L-T-P 0-0-2) Credit – 1

Note: Students will perform minimum 10 experiments from the following:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free over-fall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.

UTAR PRADESH TECHNICAL UNIVERSITY

LUCKNOW

Syllabus

For

B.TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Of

Second Year

(Effective for the Session: 2014-15 only)

UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year **SEMESTER III**

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & ProfessionalEthics/ Cyber Security	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031	Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032	Nano Sciences
NOE033	Laser Systems and Applications
NOE034	Space Sciences
NOE035	Polymer Science & Technology
NOE036	Nuclear Science
NOE037	Material Science
NOE038	Discrete Mathematics
NOE039	Applied Linear Algebra

***Human values &Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End**
Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year **SEMESTER IV**

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open elective / Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-408/NEC 409	Information Theory & Coding/ Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Language	3	1	0	30	20	50	100	150	4
6	NIT 401 /NCS-403	Multimedia & Animation /Computer Graphics	2	1	0	15	10	25	50	75	3
	AUC-002/ AUC-001	Cyber Security / Human Values & Professional Ethics	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NIT 451/ NEC-459	Multimedia & Animation Lab/Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NIT 456/ NCS 453	Colloquium /Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to al branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-043 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

***Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End
Semester Examination and 40% in aggregate.**

NEC-309: DIGITAL LOGIC DESIGN

Unit-I
Digital Design and Binary Numbers:
Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.
Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).
Unit-II
Combinational Logic:
Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic
Unit-III
Memory and Programmable Logic Devices:
Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.
Unit-IV
Synchronous Sequential Logic:
Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.
Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.
Unit-V
Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:
1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.
Abstract Data Types (ADT)
Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .
Unit – II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.
Unit – III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit – IV
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, *Galgotia Publications* Pvt Ltd Delhi India.
3. A.K. Sharma ,Data Structure Using C, Pearson Education India.
4. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
5. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .
6. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
7. P.S. Deshpandey, “C and Datastructure”, Wiley Dreamtech Publication.
8. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.
10. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, “Elements of Distcrete Mathematics”, McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, “Discrete Mathematical Structures”, Wiley India, New Delhi, First Edition, August 2010**.**
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**

  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability

  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**

  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series

  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**

  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation

  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**

  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence

  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method

  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

Recommended Books:

- *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
- *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
- *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in 'C' Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II
Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.
UNIT III
Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.
UNIT IV
Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.
UNIT V
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.

2. * Douglas V. Hall, “Microprocessors and Interfacing”, , Tata McGraw Hill.

3. Yu-cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India.

4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.

5. Peter Abel, “IBM PC Assembly language and programming”, Fifh Edition, Prentice Hall of India Pvt. Ltd.

6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I
Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.
Unit – II
Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker’s solution, Peterson’s solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.
Unit – III
CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.
Unit – IV
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.
Unit – V
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :
1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :
1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.

3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7.Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
8. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1.To implement CPU Scheduling Algorithms
- FCFS
- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms
- FIFO
- LRU

3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NEC-408: INFORMATION THEORY AND CODING

Unit I

Review of probability theory, Definition of Information Measure and Entropy: Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source, Mutual information. Asymptotic Properties of Entropy and Problem Solving in Entropy

Unit – II

Block Code and its Properties, Data compression, Kraft-Mcmillan Equality and Compact Codes, Encoding of the source output, Shannon's encoding algorithm, Coding Strategies, Huffman Coding, Shannon-Fano-Elias
Coding and Introduction to Arithmetic
Coding.

Unit – III

Introduction to Information Channels, Communication Channels, Discrete communication channels, Continuous channels. Discrete memory less Channels, Mutual information, Channel Capacity, Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem.

Unit – IV

Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding Unit – V
Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes. RS codes, Golay codes, Shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. Convolution Codes, Time domain approach. Transform domain approach.

Reference:

1.K. Sam Shanmugam, "Digital and analog communication
systems", John Wiley. 2.Simon Haykin, "Digital communication",
John Wiley.
3.Ranjan Bose, "ITC and Cryptography" ,Tata McGraw-Hill.
4. Thomas M. Cover, Joy A. Thomas ," Elements of Information Theory, 2nd Edition", Wiley Publication.
5. Roberto Togneri, Christopher J.S deSilva **"**Fundamentals of Information Theory and Coding Design**"**, CRC
Press.
6. Steven Roman," Introduction to Coding and Information Theory**"**, Springer New York.
7. Glover and Grant, "Digital Communications", Pearson Education.

NIT-401: MULTIMEDIA AND ANIMATION

Unit I – Introduction:

Introduction to Multimedia and animation, Multimedia Systems, Design Fundamentals, Elements of multimedia and animation and their use, Back ground of Art, Color theory overview, Sketching & illustration, Storyboarding, different tools for animation .

Unit- 2 – Multimedia Projects:

Multimedia Skills, Hardware, Use of Graphics in Multimedia, Overview of Vector and Raster Graphics, Basic software tools, Multimedia Authoring Tools, Planning and Costing, Designing and Producing, Contents and talent, Delivering, Enhancing and Testing Multimedia Projects.

Unit-3 – Tools of Multimedia:

Paint and Draw Applications, Graphic effects and techniques, Image File Format, Anti-aliasing, Morphing, Multimedia Authoring tools, professional development tools.

Unit-4 - Animation:

Introduction and Principles of Animations, Power of Motion, Animation Techniques, Animation File Format, Making animation for Rolling Ball, making animation for a Bouncing Ball, Animation for the web, GIF, Plug-ins and Players, Animation tools for World Wide Web.

References:

1. Tay Vaughan, "Multimedia, Making IT Work",Tata McGraw Hill.
2. Buford, "Multimedia Systems", Addison Wesley.
3. Sleinreitz, "Multimedia System", Addison Wesley.
4. Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", Pearson Education.
5.Prabhat K Andleigh, Kiran Thakrar, "Multimedia systems design", PHI Learning Private Limited, Delhi India. 6.Elsom Cook – "Principles of Interactive Multimedia" ,Tata McGraw Hill.

NIT-451: MULTIMEDIA AND ANIMATION LAB

1. Procedure to create an animation to represent the growing moon.
2. Procedure to create an animation to indicate a ball bouncing on steps.
3. Procedure to simulate movement of a cloud.
4. Procedure to draw the fan blades and to give proper animation.
5. Procedure to display the background given (filename: tulip.jpg) through your name.
6. Procedure to display the background given (filename: garden.jpg) through your name using mask.
7. Procedure to create an animation with the following features.
   WELCOME (Letters should appear one by one .The fill color of the text should change to a different colour after the display of the full word.)
8. Procedure to simulate a ball hitting another ball.
9. Procedure to design a visiting card containing at least one graphic and text information.
10. Procedure to take a photographic image. Give a title for the image. Put the border. Write your names. Write the name of institution and place.
11. Procedure to prepare a cover page for the book in your subject area. Plan your own design.
12. Procedure to extract the flower only from given photographic image and organize it on a background. Selecting your own background for organization.
13. Procedure to change a circle into a square using flash.
14. Procedure to display the background given (FILENAME: GARDEN.JPG) through your name using mask.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS
2^{nd} Year

[Effective from Session 2014-15]

1. **B.Tech. Electronics Engineering**
2. **B.Tech. Electronics & Communication Engineering**
3. **B.Tech. Electronics & Telecommunication Engineering**
4. **B.Tech. Electronics & Instrumentation Engineering**
5. **B.Tech. Instrumentation & Control Engineering**
6. **B. Tech. Applied Electronics and Control Engineering**
7. **B. Tech. Biomedical Engineering**

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering
[Effective from Session 2014-15]

YEAR 2ND SEMESTER-III

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031- NOE-039	Engg. Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering
[Effective from Session 2014-15]

YEAR 2ND SEMESTER-IV

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/ NAS-401	Science based Elective/Engg. Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/ NHU-402	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/ AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Syllabus Third semester

THEORY SUBJECTS

NEC-301 NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II.	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III.	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV.	Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.	12.1 to 12.3	6
V.	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:
1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II.	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III.	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	8
IV.	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	8
V.	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.			
Reference Books:1. Alok Dutta, “Semiconductor Devices and circuits”, Oxford University Press. 2. Donald A Neaman, “Semiconductor Physics and Devices Basic Principles” 3rd Ed TMH India.			

NEC-303 SIGNALS AND SYSTEMS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Signals**: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II.	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III.	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV.	**Systems**: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V.	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10

Text Book: P. Ramakrishna Rao, 'Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

Chi-Tsong Chen, 'Signals and Systems', 3rd Ed., Oxford University Press, 2004
V. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.

NEC-304 SWITCHING THEORY AND LOGIC DESIGN			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Digital system and binary numbers: Signed binary numbers, binary codes. Gate-level minimization: The map method up to four variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	5
II.	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III.	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	5.1 to 5.5, 5.7 to 5.8 9.1 to 9.7	9
IV.	Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.	6.1 to 6.5 7.1 to 7.3, 7.5to 7.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4^{th} Edition, Pearson Education			
Reference Books: 1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley. 2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and Principles", CRC Press Taylor & Francis group, 2010.			

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB.

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

Syllabus fourth semester

THEORY SUBJECTS

NEC-401 DATA STRUCTURE		3 1 0
Unit	Topic	Proposed number of Lectures
I.	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	8
II.	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8
III.	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	8
IV.	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	8
V.	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort	8

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI

References

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
3. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
4. Lipschutz, "Data Structures" Schaum's Outline Series, TMH
5. G A V Pai, "Data Structures and Algorithms", TMH

NEC-402 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II.	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III.	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV.	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V.	**Feedback:** The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	7
Text Book: A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.			
Reference Books: Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Ed TMH			

<table>
<tr><th colspan="4">NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION</th><th>3 1 0</th></tr>
<tr><td>Unit</td><td colspan="2">Topic</td><td>Chapter/ Section</td><td>Proposed number of Lectures</td></tr>
<tr><td>I.</td><td colspan="2">Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.
PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.</td><td>1.1 to 1.7
2.1 to 2.5
3.1 to 3.4</td><td>8</td></tr>
<tr><td>II.</td><td colspan="2">Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes
Digital voltmeter systems, digital multimeters, digital frequency meter system</td><td>4.1, 4.2, 4.4,
4.5, 4.7
6.1 to 6.3</td><td>8</td></tr>
<tr><td>III.</td><td colspan="2">Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments
AC bridge theory, capacitance bridges, Inductance bridges, Q meter</td><td>7.1, 7.3, 7.4,7.5
8.2 to 8.4, 8.9</td><td>8</td></tr>
<tr><td>IV.</td><td colspan="2">CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance.
Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications</td><td>9.1, 9.3, 9.4,9.5, 9.7, 9.9, 9.12,10.1, 10.3,10.4, 10.5</td><td>8</td></tr>
<tr><td>V.</td><td colspan="2">Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument
Recorders: X-Y recorders, plotters</td><td>12.1, 12.2 ,12.3,
13.2, 13.4</td><td>8</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td></td></tr>
<tr><td colspan="5">Text Book: David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI , New Delhi 2008.</td></tr>
<tr><td colspan="5">Reference Books:
Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009.
Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann), 2008.</td></tr>
</table>

NEC-404 ELECTROMAGNETIC FIELD THEORY			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II.	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III.	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV.	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd			

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective - To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator

Field Effect Transistors-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier

Bipolar Transistors- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.

Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier

Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain.

Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier

Oscillators -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator

Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC- 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Information Technology

2nd Year (III & IV Semester)

(Effective from Session: 2015-2016)

B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY
STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-409	Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NCS-403	Computer Graphics	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC-459	Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NCS 453	Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics/Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I
Digital Design and Binary Numbers:
Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.
Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).
Unit-II
Combinational Logic:
Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic
Unit-III
Memory and Programmable Logic Devices:
Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.
Unit-IV
Synchronous Sequential Logic:
Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.
Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.
Unit-V
Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.
Abstract Data Types (ADT)
Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .
Unit – II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.
Unit – III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit – IV
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India

2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.

3. A.K. Sharma ,Data Structure Using C, Pearson Education India.

4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.

5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .

6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.

7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.

8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education

9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.

10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**
  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability
  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**
  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series
  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**
  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation
  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**
  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence
  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method
  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

Recommended Books:

- *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
- *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
- *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in ‘C’ Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton’s Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel’s, Sterling’s and Evertt’s Interpolation formula
5. To implement Newton’s Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II
Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.
UNIT III
Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.
UNIT IV
Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.
UNIT V
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.

2. * Douglas V. Hall, “Microprocessors and Interfacing”, , Tata McGraw Hill.

3. Yu-cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India.

4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.

5. Peter Abel, “IBM PC Assembly language and programming”, Fifh Edition, Prentice Hall of India Pvt. Ltd.

6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I
Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.
Unit – II
Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker’s solution, Peterson’s solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.
Unit – III
CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.
Unit – IV
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.
Unit – V
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :

1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :

1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
8. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS
2nd Year

[Effective from Session 2014-15]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering
4. B.Tech. Electronics & Instrumentation Engineering
5. B.Tech. Instrumentation & Control Engineering
6. B. Tech. Applied Electronics and Control Engineering
7. B. Tech. Biomedical Engineering

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering
[Effective from Session 2014-15]

YEAR 2ND SEMESTER-III

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031- NOE-039	Engg. Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-IV

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/ NAS-401	Science based Elective/Engg. Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/ NHU-402	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/ AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Syllabus Third semester

THEORY SUBJECTS

NEC-301 NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II.	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III.	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV.	Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.	12.1 to 12.3	6
V.	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:
1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II.	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III.	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	8
IV.	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	8
V.	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books:1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press. 2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.			

NEC-303 SIGNALS AND SYSTEMS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Signals**: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II.	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III.	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV.	**Systems**: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V.	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10

Text Book: P. Ramakrishna Rao, 'Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi

Reference Books:

Chi-Tsong Chen, 'Signals and Systems', 3rd Ed., Oxford University Press, 2004

V. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2^{nd} Ed., 2003.

<table>
<tr><td colspan="3">NEC-304 SWITCHING THEORY AND LOGIC DESIGN</td><td>2 1 0</td></tr>
<tr><td>Unit</td><td>Topic</td><td>Chapter/ Section</td><td>Proposed number of Lectures</td></tr>
<tr><td>I.</td><td>Digital system and binary numbers: Signed binary numbers, binary codes.
Gate-level minimization: The map method up to four variable, don’t care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).</td><td>1.6, 1.7, 7.4

3.1 to 3.7, 3.10</td><td>5</td></tr>
<tr><td>II.</td><td>Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers</td><td>4.1 to 4.11</td><td>8</td></tr>
<tr><td>III.</td><td>Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.
Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.</td><td>5.1 to 5.5, 5.7 to 5.8

9.1 to 9.7</td><td>9</td></tr>
<tr><td>IV.</td><td>Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters.
Memory and programmable logic: RAM, ROM, PLA, PAL.</td><td>6.1 to 6.5

7.1 to 7.3, 7.5to 7.7</td><td>8</td></tr>
<tr><td colspan="4">Text Book: M. Morris Mano and M. D. Ciletti, “Digital Design”, 4th Edition, Pearson Education</td></tr>
<tr><td colspan="4">Reference Books: 1. Hill & Peterson, “Switching Circuit & Logic Design”, Wiley.
2. Mohammad A. Karim and Xinghao Chen, “Digital Design-Basic concepts and Principles”, CRC Press Taylor & Francis group, 2010.</td></tr>
</table>

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB.

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

Syllabus fourth semester

THEORY SUBJECTS

NEC-401 DATA STRUCTURE		3 1 0
Unit	Topic	Proposed number of Lectures
I.	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	8
II.	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8
III.	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	8
IV.	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	8
V.	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort	8

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI

References

1. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill
3. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education
4. Lipschutz, "Data Structures" Schaum's Outline Series, TMH
5. G A V Pai, "Data Structures and Algorithms", TMH

NEC-402 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II.	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III.	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV.	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V.	**Feedback:** The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	7
Text Book: A. S. Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press, 5th Ed.			
Reference Books: Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Ed TMH			

NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II.	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III.	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4,7.5 8.2 to 8.4, 8.9	8
IV.	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4,9.5, 9.7, 9.9, 9.12,10.1, 10.3,10.4, 10.5	8
V.	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2 ,12.3, 13.2, 13.4	8
Text Book: David A. Bell, “Electronic Instrumentation and Measurements”, 2nd Ed., PHI , New Delhi 2008.			
Reference Books: Oliver and Cage, “Electronic Measurements and Instrumentation”, TMH, 2009. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann), 2008.			

NEC-404 ELECTROMAGNETIC FIELD THEORY			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II.	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III.	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV.	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd			

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective - To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator

Field Effect Transistors-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier

Bipolar Transistors- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.

Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier

Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain.

Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier

Oscillators -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator

Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC- 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin’s double bridge.
8. Radio Receiver Measurements

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Information Technology

2nd Year (III & IV Semester)

(Effective from Session: 2015-2016)

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B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year SEMESTER III

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Mathematics III/Science Based Open Elective	3	1	0	30	20	50	100	150	4
2	NEC 309	Digital Logic Design	3	1	0	30	20	50	100	150	4
3	NCS 301	Data Structures Using C	3	1	0	30	20	50	100	150	4
4	NCS 302	Discrete Structures And Graph Theory	3	1	0	30	20	50	100	150	4
5	NHU301/ NHU302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCS 303	Computer Based Numerical And Statistical Techniques	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	*Human Values & Professional Ethics/ Cyber Security*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC 359	Digital Logic Design Lab	0	0	3	10	10	20	30	50	1
8	NCS 351	Data Structures Using C Lab	0	0	3	10	10	20	30	50	1
9	NCS 353	Numerical Techniques Lab	0	0	2	10	10	20	30	50	1
10	NCS 355	Advance Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP 301	GP						50		50	
		TOTAL	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

B.TECH COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

STUDY & EVALUATION SCHEME

2nd Year — SEMESTER IV

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Open Elective/ Mathematics III	3	1	0	30	20	50	100	150	4
2	NHU401/ NHU402	Industrial Psychology /Industrial Sociology	2	0	0	15	10	25	50	75	2
3	NEC-409	Introduction to Microprocessor	3	1	0	30	20	50	100	150	4
4	NCS-401	Operating System	3	1	0	30	20	50	100	150	4
5	NCS-402	Theory Of Automata and Formal Launguage	3	1	0	30	20	50	100	150	4
6	NCS-403	Computer Graphics	2	1	0	15	10	25	50	75	3
7	AUC-002/ AUC-001	*Cyber Security / Human Values & Professional Ethics*	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING											
7	NEC-459	Microprocessor Lab	0	0	3	10	10	20	30	50	1
8	NCS 451	Operating System Lab	0	0	3	10	10	20	30	50	1
9	NCS 453	Computer Graphics Lab	0	0	2	10	10	20	30	50	1
10	NCS 455	Functional and Logic Programming Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	GP						50		50	
		TOTAL	18	5	10					1000	25

The details of Science Based Electives are to be provided by The Boards of Studies of Science Subjects; these are common to all branches.

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics / Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NEC-309: DIGITAL LOGIC DESIGN

Unit-I
Digital Design and Binary Numbers:
Binary Arithmetic, Negative Numbers and their Arithmetic, Floating point representation, Binary Codes, Cyclic Codes, Error Detecting and Correcting Codes, Hamming Codes.
Minterm and Maxterm Realization of Boolean Functions, Gate-level minimization: The map method up to four variable, don't care conditions, SOP and POS simplification, NAND and NOR implementation, Quine Mc-Cluskey Method (Tabular method).
Unit-II
Combinational Logic:
Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Code Converters, Parity Generators and Checkers, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Hazards and Threshold Logic
Unit-III
Memory and Programmable Logic Devices:
Semiconductor Memories, RAM, ROM, PLA, PAL, Memory System design.
Unit-IV
Synchronous Sequential Logic:
Sequential Circuits, Storage Elements: Latches, Flip Flops, Analysis of Clocked Sequential circuits, state reduction and assignments, design procedure.
Registers and Counters: Shift Registers, Ripple Counter, Synchronous Counter, Other Counters.
Unit-V
Asynchronous Sequential Logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

References:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2.A.K .Singh, "Foundation of Digital Electronics and Logic design",New Age international.
3.M. Rafiquzzaman, "Fundamentals of Digital Logic and Microcomputer Design", Wiley Dreantech Publication.
4.ZVI Kohavi, "Switching and Finite Automata theory" ,Tata McGraw-Hill.
5.C.H Roth,Jr., "Fundamentals of Logic Design", ,Jaico Publishing.
6. Rajaraman & Radhakrishnan, "Digital Logic and Computer Organization",PHI Learning Private Limited, Delhi India.
7. Donald D. Givone, "Digital Principles and Design", Tata MCGraw Hill.
8. Marcovitz:Introduction to logic Design ,Tata Mcgraw-hill Education (India) Pvt. Ltd.

NCS-301: DATA STRUCTURES USING – C

Unit - I
Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.
Abstract Data Types (ADT)
Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List .
Unit – II
Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.
Unit – III
Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.
Unit – IV
Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks

Unit – V

Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees(BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies

Storage Management: Garbage Collection and Compaction.

References :

1. Aaron M. Tenenbaum,YedidyahLangsam and Moshe J. Augenstein "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India

2. Horowitz and Sahani, "Fundamentals of Data Structures", *Galgotia Publications* Pvt Ltd Delhi India.

3. A.K. Sharma ,Data Structure Using C, Pearson Education India.

4. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.

5. Lipschutz, "Data Structures" Schaum's Outline Series, Tata Mcgraw-hill Education (India) Pvt. Ltd .

6. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.

7. P.S. Deshpandey, "C and Datastructure", Wiley Dreamtech Publication.

8. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education

9. Berztiss, A.T.: Data structures, Theory and Practice :, Academic Press.

10. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.

NCS-302: DISCRETE STRUCTURES AND GRAPH THEORY

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs,Set Identities.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.

Functions: Definition, Classification of functions,Operations on functions, Recursively defined functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

Unit-II

Algebraic Structures: Definition, Groups, Subgroupsand order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo n.

Unit-III

Partial order sets: Definition, Partial order sets,Combination of partial order sets, Hasse diagram.

Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice,Morphisms of lattices.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplificationof Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference ,Natural Deduction.

Predicate Logic: First order predicate, well formedformula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.

Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring .

Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References :

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. Y. N. Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI Learning Private Limited, Delhi India.
6. Biswal ,"Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
7. Goodaire and Parmenter," Discrete Mathematics with Graph Theory", PHI Learning Private Limited, Delhi India.
8. Lipschutz "Discrete Mathematics" Mc Graw Hill
9. Deo N., "Graph Theory with Applications to Engineering and Computer Science", PHI Learning Private Limited, Delhi India

NCS-303: Computer Based Numerical and Statistical Techniques

- **Unit –I :**
  Computer Arithmetic and Errors: Floating Point Arithmetic, Machine epsilon, Round off Error, Chopping Error, Truncation Error, Associative and Distributive Law in Floating Point arithmetic, Inherent Error, Error propagation, Numerical Instability
  Roots of Equation: Secant Method, Newton Raphson Method and Fixed point Iteration Methods for Simple roots and derivation of their rate of convergence, Aitken Acceleration of Convergence, Modified Newton Raphson Method for Multiple roots, Birge-Vieta Method for Polynomials, Bairstrow Method for quadratic factors, Computer Algorithms of these methods.

- **Unit –II**
  Interpolation: Algorithms and Error Analysis of Lagrange and Newton divided difference interpolations, Relationship in various difference operators, Piecewise Linear Interpolation, Cubic Spline Interpolation, Natural Spline, Chebshev Polynomial Approximations, Lanczos Economization of Power Series
  Curve fitting: Linear and Non Linear Least Squares Approximation, ill Conditioning in Least Squares Methods, Gram-Schmidt Process of Orthogonalization. Computer Algorithms of Least Square Curve Fitting

- **Unit – III**
  Differentiation: Methods based on Interpolation and Finite Differences, Richrdson Extrapolation
  Integration: Error Analysis of Trepezoidal and Simpson Methods, Newton Cotes Integration Methods, Guassian Integration Methods: Guass Legendre Method, Lobatto Integration Method and Radau Integration Method, Error Terms in Integration Methods

- **Unit – IV**
  Solution of Simultaneous Linear Algebraic Equations: Guass Elimination Method, ill Conditioned Systems, Condition Number, Successive Over Relaxation Method, Rate of Convergence
  Solution of Ordinary Differential equations: Single Step Methods-Runge-Kutta Second Order, Third Order and Fourth Order Methods, Multi Step Method-Predictor- Corrector Method
  Statistical Techniques: Statistical Hypotheses, Test of Hypotheses, Type-I and Type-II Errors, Level of Significance, Test involving Normal Distribution

Recommended Books:

- *Numerical Methods: M.K. Jain, S.R.K. Iyenger and R.K. Jain*
- *Applied Numerical Analysis: Curtis F. Gerald and Patrick O. Wheatley*
- *Schaum's Outline of Theory and Problems of Statistics: Murray R. Spiegel*

NEC-359: LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.
1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-351: DATA STRUCTURE USING C LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-353: NUMERICAL TECHNIQUES LAB

Write Programs in ‘C’ Language:

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton’s Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel’s, Sterling’s and Evertt’s Interpolation formula
5. To implement Newton’s Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and 0Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R^2 for atleast two independent variables.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-355: ADVANCE PROGRAMMING LAB

LIST OF EXPERIMENTS:

1. Programs using Functions and Pointers in C
2. Programs using Files in C
3. Programs using Classes and Objects
4. Programs using Operator Overloading
5. Programs using Inheritance, Polymorphism and its types
6. Programs using Arrays and Pointers
7. Programs using Dynamic memory allocation
8. Programs using Templates and Exceptions
9. Programs using Sequential and Random access files

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NEC 409: INTRODUCTION TO MICROPROCESSOR

UNIT I

Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU,Example of an 8085 based computer, Memory interfacing.

UNIT II
Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.
UNIT III
Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.
UNIT IV
Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.
UNIT V
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References :

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, 5th Edition, Penram International Publication (India) Pvt. Ltd.

2. * Douglas V. Hall, “Microprocessors and Interfacing”, , Tata McGraw Hill.

3. Yu-cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India.

4. Barry B. Brey, “The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, PentiumPro Processor, PentiumII, PentiumIII, Pentium IV, Architecture, Programming & Interfacing”, Eighth Edition, Pearson Prentice Hall, 2009.

5. Peter Abel, “IBM PC Assembly language and programming”, Fifh Edition, Prentice Hall of India Pvt. Ltd.

6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Pearson education, .

NCS-401: OPERATING SYSTEM

Unit – I
Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.
Unit – II
Concurrent Processes: Process Concept, Principle ofConcurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker’s solution, Peterson’s solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.
Unit – III
CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.
Unit – IV
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.
Unit – V
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, Filesystem implementation issues, File system protection and security.

References :
1. Silberschatz, Galvin and Gagne, “Operating Systems Concepts”, Wiley
2. SibsankarHalder and Alex A Aravind, “Operating Systems”, Pearson Education
3. Harvey M Dietel, “ An Introduction to Operating System”, Pearson Education
4. D M Dhamdhere, “Operating Systems : A Concept basedApproach”, McGraw Hill.
5. Charles Crowley, “Operating Systems: A Design-Oriented Approach”, Tata McGraw Hill Education”.
6. Stuart E. Madnick & John J. *Donovan. Operating Systems.* McGraw Hill.

NCS-402: THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transi ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen’s Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation , Derivation trees, Ambiguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs.

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church’s Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory

References :
1. Hopcroft, Ullman, “Introduction to Automata Theory,Languages and Computation”, Pearson Education .
2. K.L.P. Mishra and N.Chandrasekaran, “Theory of Computer Science : Automata, Languages and Computation”, PHI Learning Private Limited, Delhi India.
3.Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. Y.N.Singh “Mathematical Foundation of Computer Science”, New Age International.
5. Papadimitrou, C. and Lewis, C.L., “Elements of the Theory of Computation”, PHI Learning Private Limited, Delhi India.
6. K.Krithivasan and R.Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
7. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
8. Micheal Sipser, “Introduction of the Theory and Computation”, Thomson Learning.

NCS-403: COMPUTER GRAPHICS

Unit – I

Introduction and Line Generation:Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid pointcircle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations:Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.
Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.
Unit – III
Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.
Unit – IV
Curves and Surfaces:Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.
Hidden Lines and Surfaces:Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References :

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education
2. Amrendra N Sinha and Arun D Udai," Computer Graphics", Tata MCGraw Hill.
3. Donald Hearn and M Pauline Baker, "Computer Graphics with OpenGL", Pearson education
4. R.K. Maurya, "Computer Graphics " Wiley Dreamtech Publication.
5. Rogers, " Procedural Elements of Computer Graphics", McGraw Hill
6. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited, Delhi India.
7. Foley, Vandam, Feiner, Hughes – "Computer Graphics principle", Pearson Education.
8. W. M. Newman, R. F. Sproull – "Principles of Interactive computer Graphics" – Tata MCGraw Hill.

NEC-459: MICROPROCESSOR LAB

1. To study 8085 microprocessor system
2. To study 8086 microprocessor system
3. To develop and run a programme to find out largest and smallest number
4. To develop and run a programme for converting temperature from F to C degree
5. To develop and run a programme to compute square root of a given number
6. To develop and run a programme for computing ascending/descending order of a number.
7. To perform interfacing of RAM chip to 8085/8086
8. To perform interfacing of keyboard controller
9. To perform interfacing of DMA controller
10. To perform interfacing of UART/USART

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-451: OPERATING SYSTEM LAB

1.To implement CPU Scheduling Algorithms
- FCFS
- SJF
- SRTF
- PRIORITY
- ROUND ROBIN

2. Simulate all Page Replacement Algorithms
- FIFO
- LRU

3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NCS-453: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6.To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7.To implement Liang Barksy Line Clipping Algorithm.
8.To perform 3D Transformations such as translation, rotation and scaling.
9.To convert between color models.
10.To perform animation using any Animation software
11.To perform basic operations on image using any image editing software
12.To draw different shapes such as hut,face ,kite ,fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

NCS-455: FUNCTIONAL AND LOGIC PROGRAMMING LAB

Program in SML- NJ or CAML for following:

1. To implement Linear Search.
2. To implement Binary Search.
3. To implement Bubble Sorting.
4. To implement Selection Sorting.
5. To implement Insertion Sorting.

Implement using LISP

6. Write a function that compute the factorial of a number.(factorial of 0 is 1, and factorial of n is n*(n-1)*...1.Factorial is defined only for integers greater than or equal to 0.)
7. Write a function that evaluate a fully parenthesized infix arithmetic expression . For examples, (infix (1+(2*3))) should return 7.
8. Write a function that perform a depth first traversal of binary tree. The function should return a list containing the tree nodes in the order they were visited.
9. Write a LISP program for water jug problem.
10. Write a LISP program that determines whether an integer is prime.
11. Write a PROLOG program that answers questions about family members and relationships includes predicates and rules which define sister,brother,father,mother,grandchild,grandfather and uncle. The program should be able to answer queries such as the following :

    - father(x,Amit)
    - grandson(x,y)
    - uncle(sumit,puneet)
    - mother(anita,x)

Note: The Instructor may add/delete/modify/tune experiments, wherever he/shefeels in a justified manner.

PROPOSED STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING

Semester I

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Norms	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NEC-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment CT	TA	Total	ESE		
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-603 Special Electrical Machines	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-011-NEE-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEE-021-NEE-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651 Power System Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEE-652 Electrical CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE 701 FACTS	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-703 Power Station Practice	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEE-031 NEE-034 Departmental Elective-III	Departmental Elective - III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-751 Drives Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEE-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEE-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit	
						Sessional Assessment			ESE			
			L	T	P	CT	TA	Total				
THEORY SUBJECT												
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4	
2	NEE 801 Utilization Of Electrical Energy & Traction	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2	
3	NEE 041 – NEE 044 Departmental Elective - IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4	
4	NEC-809 Communication Engg	Departmental Elective -V	3	1	0	30	20	50	100	150	4	
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2	
PRACTICAL/DESIGN/DRAWING												
6	NEE 851 Project	Project			12		100	100	250	350	8	
7		GP						50		50		
8		TOTAL	13	5	12					1000	24	

PROPOSED STUDY AND EVELUATION SCHEME OF

ELECTRICAL & ELECTRONICS ENGINEERING

Semester I

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Norms	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NECN-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEN 603 / EEC 501 Integrated Circuits	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN-011-NEN-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEN 021-NEN-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEC 651 IC Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEN-652 Electronics CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEN-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEN 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEN 701 Analog & Digital Communication	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN 702 Digital Signal Processing	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEN-031 NEN-034 Departmental Elective-III	Departmental Elective - III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEN-751 Digital Signal Processing Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEN-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEN-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4
2	NEC 801 Data Communication Networks	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2
3	NEN 041 – NEN 044 Departmental Elective -IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4
4	NEN 051 – NEN 054 Departmental Elective -V	Departmental Elective -V	3	1	0	30	20	50	100	150	4
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
6	NEN 851 Project	Project			12		100	100	250	350	8
7		GP						50		50	
8		TOTAL	13	5	12					1000	24

NEE – 301: ELECTRO-MECHANICAL ENERGY CONVERSION –I
L T P 3 1 0

Unit – I

Principles of Electro-mechanical Energy Conversion- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque , Generated emf in machines; Torque in machines with cylindrical air gap. (7)

Unit – II

D.C. Machines- Construction of DC Machines, Armature winding, Emf and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C. generators. (9)

Unit –III

D.C. Machines (Contd.)- Performance characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test). (8)

Unit – IV

Single Phase Transformer- Phasor diagram, Efficiency and voltage regulation, All day efficiency.

Testing of Transformers- O.C. and S.C. tests, Sumpner's test, Polarity test.

Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits & demerits and applications. (8)

Unit – V

Three Phase Transformers - Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.(9)

Text Books:

1 I.J. Nagrath & D.P.Kothari, " Electrical Machines", Tata McGraw Hill
2 Husain Ashfaq , " Electrical Machines", Dhanpat Rai & Sons
3 P.S.Bimbhra, "Electrical Machinery", Khanna Publisher
4. A.E. Fitggerald, C.Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

5 Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
6 M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
7 P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers

NEE-302: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L T P 3 1 0

UNIT I

(1) Philosophy of Measurement- Methods of measurement, Measurement system**,** Classification of instrument systems, Characteristics of instruments & measurement systems**,** Errors in measurement & its analysis, Standards. (4)

(2) Analog Measurement of Electrical Quantities- Electrodynamic, Thermocouple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynamic wattmeter, Three Phase wattmeter, Power in three phase systems, Errors & remedies in wattmeter and energy meter. (5)

UNIT II

Instrument Transformers:CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (8)

UNIT III

Measurement of Parameters- Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Q meter. (9)

UNIT IV

(1) AC Potentiometers- Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. (4)

(2) Magnetic Measurement- Ballistic galvanometer, Flux meter**,** Determination of hysteresis loop, measurement of iron losses**.** (4)

UNIT V

(1) Digital Measurement of Electrical Quantities- Concept of digital measurement, Block diagram, Study of digital voltmeter, Frequency meter, *Spectrum analyzer*, Electronic multimeter. (3)

(2) Cathode Ray Oscilloscope- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components**,** Applications of CRO in measurement, Lissajous Pattern, Dual trace & dual beam oscilloscopes. (3)

Text Book:

1. E. W. Golding & F. C. Widdis, “Electrical Measurement &Measuring Instrument”, A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, “Electrical & Electronic Measurement & Instrument”, Dhanpat Rai & Sons, India
3. Purkait, “Electrical & Electronics Measurement & Instrumentation”, TMH

Reference Books:

4. Forest K. Harris, “Electrical Measurement”, Willey Eastern Pvt. Ltd. India
5. M. B. Stout , “Basic Electrical Measurement”, Prentice Hall of India
6. W. D. Cooper, “Electronic Instrument & Measurement Technique”, Prentice Hall International
7. J. B. Gupta, “Electrical Measurement & Measuring Instrument”, S. K. Kataria & Sons

NEE-303- BASIC SYSTEM ANALYSIS
L T P 3 1 0

UNIT I

Introduction to Continuous Time Signals and Systems- Basic continuous time signals, Unit step, Unit ramp, Unit impulse and periodic signals with their mathematical representation and characteristics. *Inversion, Shifting and Scaling of signals,* Introduction to various types of systems, *Causal, Stable, Linear and Time invariant systems.*

Analogous System- Linear mechanical elements, Force-voltage and force-current analogy, Modeling of mechanical and electro-mechanical systems. (9)

UNIT II

Fourier Transform Analysis- Exponential form and *compact* trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis. (8)

UNIT III

Laplace Transform- Review of Laplace Transform, Initial and Final Value theorems, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to analysis of networks, Waveform synthesis and Laplace Transform of complex waveforms. (8)

UNIT IV

State – Variable Analysis- Introduction, State Space representation of linear systems, Transfer Function and State Variables, State Transition Matrix, Solution of State Equations for homogeneous and non-homogeneous systems, Applications of State-Variable technique to the analysis of linear systems. (8)

UNIT IV

Z-Transform Analysis- Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function. (7)

Text Books:

1. Oppenhiem, Wilsky, Nawab, “Signals & Systems”, PHI
2. M E Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
3. A. Anand Kumar, “ Signals & Systems”, PHI
4. Choudhary D. Roy, “Network & Systems”, Wiley Eastern Ltd.

Reference Books:

5. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
6. Donald E. Scott, “Introduction to circuit Analysis” Mc. Graw Hill
7. B. P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
8. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, “Singnals and Systems”, Tata Mc. Graw Hill, 2001.
9. Taan S. Elali & Mohd. A. Karim, “Continuous Signals and Systems with MATLAB” 2nd Edition, CRC Press.

NEE-401: ELECTRO-MECHANICAL ENERGY CONVERSION - II
L T P 3 1 0

UNIT - I

Synchronous Machine I - Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient. (9)

UNIT - II

Synchronous Machine II - Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor - Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser. (8)

UNIT - III

Three phase Induction Machine – I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque- slip characteristics, No load & blocked rotor tests, Efficiency, Induction generator & its applications. (9)

UNIT - IV

Three phase Induction Machine- II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit). (8)

UNIT - V

Single phase Induction Motor - Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor.

AC Commutator Motors - Universal motor, Single phase a.c. series compensated motor, Stepper motors. (8)

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain "Electric Machines", Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans "Electric Machinery", MC Graw Hill.
4. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers
6. M.G.Say, "Alternating Current Machines", Pitman & Sons

NEE- 402 NETWORK ANALYSIS AND SYNTHESIS
L T P 3 1 0

Unit – I

Graph Theory- Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analyses. (7)

Unit – II:

Network Theorems (Applications to AC Networks)- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem. (8)

Unit – III

Transient Circuit Analysis- Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. (7)

Unit – IV

Network Functions- *Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.* (3)

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation. (8)

Unit – V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (5)

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters. (4)

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. C. L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill
3. M. E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T. S. K. V. Iyer, "Circuit Theory", Tata McGraw Hill
5. Joseph A. Edminister, " Theory & Problems of Electric Circuits", McGraw Hill

NEE – 403: ELECTRICAL INSTRUMENTATION AND PROCESS CONTROL

L T P 2 1 0

Unit-I

Transducer – I

Definition, Advantages of electrical transducers, Classification, Characteristics, Factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT (7)

Unit-II

Transducer – II

Capacitive, Piezoelectric, Hall effect and Opto electronic transducers. Measurement of motion, force, pressure, temperature, flow and liquid level. (6)

Unit-III

Telemetry

General telemetry system, Land line & radio frequency telemetering systems, Transmission channels and media, Data receiver & transmitter.

Acquisition System

Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV

Display Devices and Recorders

Display devices, Storage oscilloscope, Spectrum analyzer, Strip chart & X-Y recorders, Magnetic tape & digital tape recorders.

Process Control

Principle, Elements of process control system, Process characteristics, Electronic, pneumatic & digital controllers. (7)

Text Books:

1. A. K. Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons
2. B.C. Nakra & K.Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, “Process Control Instrumentation Technology”, Prentice Hall

Reference Books:

4. E. O. Decblin, “Measurement System – Application & design”, Mc Graw Hill.
5. W. D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International
6. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI Learning.

NEE 409 ELECTRICAL MACHINES & AUTOMATIC CONTROL
L T P 3 1 0

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.
Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt- Amp relations, Efficiency, Advantages & Disadvantages, Applications.
D.C. Motors: Concept of starting, Speed control, Losses and Efficiency *(simple numericals only)*

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque- slip characteristics, Speed control *(simple numericals only)*.
Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. *(simple numericals only)*
Synchronous Motor *(conceptual treatment only)*: Starting, Effect of excitation on line current (V-curves), Synchronous condenser.
Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force- current analogy, Electrical analog of simple mechanical systems; Concept of transfer function & its determination for simple systems.
Control System: Open loop & closed loop controls systems; advantages and disadvantages.
Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.
Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, Limitations (*simple numerical only*); *Only conceptual treatment of* Polar plot, Nyquist stability criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and Phase margin and their determination.
Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text Book:

1. I. J. Nagrath & D. P. Kothari, "Electrical machines", Tata McGraw Hill.
2. P.S.Bimbhra, "Electrical Machinery", Khanna Publishers
3. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
4. Ghosh, "Control Systems: Theory and Applications", Pearson

Reference Books:

5. B.C. Kuo, "Automatic Control systems", Wiley India Ltd.
6. D. Roy Choudhary, "Modern Control Engineering" Prentice Hall of India.
7. M. Gopal, "Control Systems: Principles and Design" Tata McGraw Hill.

NEE – 459 : ELECTRICAL MACHINES & AUTOMATIC CONTROL LAB
L T P 0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System [Out of total 10, at least 04 experiments should be Simulation based]

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an AC 2-phase servo motor.
4. To study dc servo position control system within P and PI configurations.
6. To study Synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

NEE-351: ELECTROMECHANICAL ENERGY CONVERSION- I LAB
L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1 To obtain magnetization characteristics of a d.c. shunt generator.
2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3 To obtain efficiency of a dc shunt machine using Swinburn's test.
4 To perform Hopkinson's test and determine losses and efficiency of DC machine.
5 To obtain speed-torque characteristics of a dc shunt motor.
6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/Static Ward –Leonard method.
8 To study polarity and ratio test of single phase and 3-phase transformers.
9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11 To obtain 3-phase to 2-phase conversion by Scott connection.
12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

College may add any two S/W based experiments in the above list.

NEE-352: ELECTRICAL MEASUREMENT LAB
L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin's double bridge.
6. Measurement of voltage, current and resistance using dc potentiometer.
7. Measurement of inductance by Maxwell's bridge.
8. Measurement of inductance by Hay's bridge.
9. Measurement of inductance by Anderson's bridge.
10. Measurement of capacitance by Owen's bridge.
11. Measurement of capacitance by De Sauty bridge.
12. Measurement of capacitance by Schering bridge.
13. Study of frequency and differential time counter.

College may add any two experiments in the above list.

NEE-353: NUMERICAL TECHNIQUE LAB

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list:

S/W Based Experiments using MATLAB or Equivalent software.

1. Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
6. Solution of differential equations using 4th order Runge-Kutta method.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.
9. Determination of time response of an R-L-C circuit.

College may add any three experiments in the above list.

NEE- 451: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY

L T P 0 0 3

Note: Minimum eight experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method.

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

NEE-452: NETWORK LABORATORY

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin’s theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.
11. Determination of frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.

College may add any three S/W based experiments in the above list.

NEE – 453: ELECTRICAL INSTRUMENTATION LAB.

L T P 0 0 2

Minimum eight experiments are to be performed from the following list.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer

College may add any three S/W based experiments in the above list.

NEE-454 ELECTRONICS LAB

L T P 0 0 2

ANALOG ELECTRONICS:

Note: Select at least any four out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any four out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

Evaluation Scheme & Syllabus for

MBA Second Year

On

Choice Based Credit System

(Effective from the Session: 2017-18)

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**

MBA Evaluation Scheme for Session 2017 - 2018
Semester III

S. No.	Subject Code	Subject Title	Periods			Evaluation Scheme					Credit
						Sessional			ESE	Total	
			L	T	P	CT	TA	Total			
1	RMB301	Strategic Management	3	0	0	20	10	30	70	100	3
2	RMB302	International Business Management	3	0	0	20	10	30	70	100	3
3		Major Specialization Group Elective 1	3	0	0	20	10	30	70	100	3
4		Major Specialization Group Elective 2	3	0	0	20	10	30	70	100	3
5		Major Specialization Group Elective 3	3	0	0	20	10	30	70	100	3
6		Minor Specialization Group Elective 1	3	0	0	20	10	30	70	100	3
7		Minor Specialization Group Elective 2	3	0	0	20	10	30	70	100	3
8	RVE301	Universal Human Values and Professional Ethics	3	0	0	20	10	30	70	100	3
9	RMB351	Summer Training Project Report & Viva Voce	0	0	6		30	30	70	100	3
TOTAL										**900**	**27**

ESE- End Semester Examination
CA - Class Test
TA - Teacher Assessment

Electives for MBA III Semester (2017-18)

For major specialization, student will select all three (03) elective subjects from that group and for minor specialization, student will select any two (02) elective subjects from that group.

Specialization Group: Human Resource

S. No.	Subject Code	Subject Title
1	RMBHR01	Talent Management
2	RMBHR02	Performance and Reward Management
3	RMBHR03	Industrial Relations and Labour Laws

Specialization Group: Marketing

S. No.	Subject Code	Subject Title
1	RMBMK01	Sales & Distribution Management
2	RMBMK02	Consumer Behaviour
3	RMBMK03	Digital Marketing

Specialization Group: Finance

S. No.	Subject Code	Subject Title
1	RMBFM01	Security Analysis & Portfolio Management
2	RMBFM02	Tax Planning & Management
3	RMBFM03	Financial Market & Commercial Banking

Specialization Group: International Business

S. No.	Subject Code	Subject Title
1	RMBIB01	International Marketing
2	RMBIB02	International Logistics
3	RMBIB03	Export Import Documentation

Specialization Group: Information Technology

S. No.	Subject Code	Subject Title
1	RMBIT01	Enterprise Resource Planning
2	RMBIT02	Web Technology & E- Commerce
3	RMBIT03	Cloud Computing for Business

Specialization Group: Operations

S. No.	Subject Code	Subject Title
1	RMBOP01	Supply Chain Management
2	RMBOP02	Materials Management
3	RMBOP03	Production Planning & Control

Semester IV

S. No.	Subject Code	Course Title	Periods			Evaluation Scheme					Credit
						Sessional			ESE	Total	
			L	T	P	CT	TA	Total			
1	RMB401	Corporate Governance : Values and Ethics	4	0	0	20	10	30	70	100	4
2	RMB402	Entrepreneurship Development	4	0	0	20	10	30	70	100	4
3		Major Specialization Group Elective 4	3	0	0	20	10	30	70	100	3
4		Major Specialization Group Elective 5	3	0	0	20	10	30	70	100	3
5		Minor Specialization Group Elective 3	3	0	0	20	10	30	70	100	3
6	RHU001	Cyber Security	3	0	0	20	10	30	70	100	3
7	RMB 451	Research Project Report and Viva Voce	0	0	12		60	60	140	200	7
TOTAL										**800**	**27**

ESE- End Semester Examination
CA - Class Test
TA - Teacher Assessment

Electives for MBA IV Semester (2017-18)

For major specialization, student will select all two (02) elective subjects from that group and for minor specialization, student will select any one (01) elective subjects from that group.

Specialization Group: Human Resource

S. No.	Subject Code	Subject Title
1	RMBHR04	Training & Development
2	RMBHR05	Negotiation & Conflict Management

Specialization Group: Marketing

S. No.	Subject Code	Subject Title
1	RMBMK04	Marketing of Services
2	RMBMK05	Integrated Marketing Communication

Specialization Group: Finance

S. No.	Subject Code	Subject Title
1	RMBFM04	Working Capital Management
2	RMBFM05	Financial Derivatives

Specialization Group: International Business

S. No.	Subject Code	Subject Title
1	RMBIB04	Trading Blocks & Foreign Trade Frame Work
2	RMBIB05	Cross Cultural Management

Specialization Group: Information Technology

S. No.	Subject Code	Subject Title
1	RMBIT04	Database Management System
2	RMBIT05	System Analysis & Design

Specialization Group: Operations

S. No.	Subject Code	Subject Title
1	RMBOP04	World Class Manufacturing & Maintenance Management
2	RMBOP05	Contract and Project Management

RMB351: Summer Training Project Report

1. At the end of second semester examination, it is mandatory for every student of MBA to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

2. During the training, the student is expected to learn about the organization and analyze and suggest solutions of a live problem. The objective is to equip the student with the knowledge of actual functioning of the organization and problems faced by them for exploring feasible suggestions.

3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.

4. The student, after the completion of training will submit a report to the College/Institute which will form part of third semester examination. However, the report must be submitted by the end of September 30.

5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of micro problem, ordinarily assigned by the organization where student undergoes training. Relevant tables and bibliography should support it. One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. This chapter will form part 1 of the report. Part 2 of the report will contain the study of micro research problem. The average size of report ordinarily will be of minimum 100 pages in standard font size(12) and double spacing. Two neatly typed and soft bound (paper back) copies of the report will be submitted to the College/Institute. The report will be typed in A-4 size paper.

6. The report will have two certificates. One by the Head of the Department and the other by the Reporting Officer of the organization where the student has undergone training. These two certificates should be attached in the beginning of the report.

7. The Summer Training Project Report will carry 100 marks and will be evaluated by two examiners (external and internal). The evaluation will consist of (1) Project Report evaluation (2) Project Presentation and Viva. The Project Report evaluation will comprise of 30 marks and would be evaluated by internal project guide. The Presentation and Viva Voce would comprise of 70 marks and would be evaluated by two examiners (1 external and 1 internal). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to the third examiner. Only such person will evaluate the project report who has minimum three years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.

8. The parameters on which both evaluation (1 & 2 mentioned above) would be carried on would be:

Project Report Evaluation:

Evaluation Criteria	Relevance of Objectives with topic (10)	Relevance of Research Methodology (10)	Interpretation & Analysis (10)	Total (30)

Presentation and Viva Voce Evaluation:

Evaluation Criteria	Understanding of Objectives with topic (15)	Understanding of Relevance of Research (15)	Interpretation & Analysis (15)	Presentation & Communication Skill (15)	Query Handling (10)	Total (70)

9. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.

10. The student shall prepare the Summer Training Project Report as per the format given in the Summer Training Manual as prescribed by the University.

RMB451: Research Project Report

1. In fourth semester, the candidates will have to submit a Research Project Report on a problem/topic (from the specialization areas) to be assigned by the department MBA under the supervision of a core faculty member of the department. The Research Project Report will carry 200 marks. The evaluation of the project report will be done by two examiners (external & internal). The evaluation will consist of (1) Evaluation of Project Report(2) Evaluation of Viva on Project. The evaluation of Project Report will comprise of 60 marks and would be evaluated by internal guide. The evaluation of Viva Voce of Project would comprise of 140 marks and would be evaluated by two examiners (1 external and 1 internal).The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to the third examiner. In such cases the average of two closer awards (given by three examiners) will be taken into account for the results. The report will contain the objectives and scope of the study. Research Methodology, use, importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit two copies of the report to the Head of MBA program. The number of pages in the report will be 75 or more. The report should be typed in A-4 size paper.

   The parameter on which both evaluation (1 & 2) would be carried on would be on the basis of:

The scheme of evaluation for Project Report

Evaluation Criteria	Relevance of Objectives with topic (20)	Relevance of Research Methodology(20)	Interpretation & Analysis (20)	Total (60)

The scheme of evaluation of Viva voce

Evaluation Criteria	Understanding of Objectives with Topic (30)	Understanding of Relevance of Research (30)	Interpretation & Analysis (40)	Presentation & Communication skill (20)	Query Handling (20)	Total (140)

The student shall prepare the Research Project Report as per the format given in the Research Project Report Manual as prescribed by the University.

Strategic Management

Code: RMB 301

Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES: The objectives of this course:

- ☐ A clear understanding of the key concepts and principles of strategic management
- ☐ A set of useful analytical skills, tools and techniques for analyzing a company strategically
- ☐ To provide a basic understanding of the nature and dynamics of the strategy formulation and implementation processes.
- ☐ To encourage students to think critically and strategically.
- ☐ The ability to identify strategic issues and design appropriate courses of action.

UNIT 1 **(6 Hours)**

Introduction: meaning nature, scope, and importance of strategy; and strategic management, Introduction to Business policy, Strategic decision-making , Process of strategic management and levels at which strategy operates , strategic intent: Vision, Mission, Business definition, Goals and Objectives

UNIT 2 **(8 hours)**

Environmental Scanning : Factors considered, approaches, External environment analysis: PESTEL Analysis, EFE matrix (External Factor Evaluation): Porter's Five

Forces Model methods and techniques used , Internal Appraisal – The internal environment, Organizational Capability Factors, organizational appraisal- factors affecting, approaches, methods & techniques Resource Based View (RBW) Analysis, VRIO Framework, Value Chain Analysis, IFE matrix (Internal Factor Evaluation).

UNIT 3 **(8 hours)**

Strategy Formulation: Corporate, Business, Functional strategy **Corporate Level Strategies:** -- Stability, Expansion, Retrenchment and Combination strategies.

Concentration Strategies, Integration Strategies: Horizontal & Vertical, Diversification: Related & Unrelated, Internationalization , Porters Model of competitive advantage of nations, Cooperative: Mergers & acquisition Strategies, Joint Venture, Strategic Alliance , Digitalization Strategies.

Unit 4 **(8 hours)**

Strategy Analysis : Process, Analysing Strategic alternative, Evaluating and Choosing Among Strategic Alternative, Tools & Techniques of strategic Analysis,

Strategic Choice. BCG Matrix, Ansoff Grid, GE Nine Cell Planning Grid, Hofer's Product market evolution. McKinsey's 7'S framework

Strategy implementation: Resource allocation, Projects and Procedural issues. Organistion structure and systems in strategy implementation. Leadership and corporate culture, Values, Ethics and Social responsibility. Operational and derived functional plans to implement strategy. Integration of functional plans.

Unit 5 **(6 hours)**

Strategy Evaluation & Control : Nature, Importance, Organistional systems and Techniques of strategic evaluation & control.

COURSE OUTCOMES: Upon completion of this course, students will be able to complete the following key tasks

- ☐ Formulate organizational vision, mission, goals, and values.
- ☐ Develop strategies and action plans to achieve an organization's vision, mission, and goals
- ☐ Develop powers of managerial judgment, how to assess business risk, and improve ability to make sound decisions and achieve effective outcomes.
- ☐ Evaluate and revise programs and procedures in order to achieve organizational goals;
- ☐ Consider the ethical dimensions of the strategic management process;

Text Books

1. Kazmi, Azhar; Business Policy and Strategic Management; McGraw-Hill Education
2. David, Fred; Strategic Management: Concepts and Cases;PHI Learning

Reference Books

1. Thomson, Arthur A. and Strickland, A. J.; Strategic Management: Concept and Cases; McGrawHill Education
2. Jauch, L.F., and Glueck, W.F.; Business Policy and Strategic Management; McGraw-Hill Education
3. Wheelen, L. Thomas and Hunger, David J.; Strategic Management and Business Policy, Crafting and Executing Strategy; Pearson Education

Skills	**Measuring tool**
Ability to scan business environment	Case study + Workshop
Ability to draft strategic intent.	Case study + Workshop
Ability to draft strategy formulation and Implementation	Case study + Workshop

INTERNATIONAL BUSINESS MANAGEMENT

Code: RMB 302

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To give the student an exposure to the dynamic environment of International Business
- ☐ To understand the impact of environment on the International Business Operations of the firm
- ☐ To explain the functions and form of the global monetary system
- ☐ To explain the role of International organizations and Regional Trade

Unit I **(8 hours)**

Introduction: Meaning, Nature and Scope of International Management, Driving and Restraining Forces, Domestic to Transnational Business, Modes of Entry.

Globalization – Forces, Meaning, dimensions and stages in Globalization, Characteristics and role of MNCs. International Business Environment – The economic environment; social and cultural environment, political, legal and regulatory environment, natural environment, technological environment.

Unit 2 **(8 hours)**

International Trade Theories: Mercantilism; Absolute Cost theory, Comparative Cost theory, Factor endowment theory, International Product life Cycles Theory,

International Investment Theories: Theory of Capital Movements, Market Imperfections theory; Internationalization Theory; Location Specific Advantage Theory; Eclectic Theory

Free Trade: Advantages and Disadvantages, Forms of Protection: Tariffs, Subsidies, Import Quotas, Voluntary Export Restraints, Administrative Policy, Anti-dumping Policy.

Unit 3 **(8 hours)**

International Marketing: Nature & significance, International Marketing Orientations, International Segmentation, International Product Life Cycle

International HRM: International Staffing Approaches, Expatriate Management,

International Labor Relations

Unit 4 **(6 hours)**

Foreign Exchange Determination Systems: Basic Concepts Relating to Foreign Exchange, Various types of Exchange Rate Regimes, Factors Affecting Exchange Rates, Brief History of Indian Rupee

Unit 5 **(6 hours)**

International Institutions: Objectives and Functions of WTO, IMF, IBRD, UNCTAD,

Regional Economic Integration: Introduction, Levels of Economic Integration, Objectives and Functions of EU, NAFTA, ASEAN, SAARC, BRICS

Text Books

1. Hill - International Business, McGraw-Hill
2. Cherunilam F- International Business: Text and Cases, PHI

Reference Books

1. Aswathappa- International Business, McGraw-Hill
2. Cherunilam, F - International Trade and Export Management, Himalaya
3. Daniels - International Business (Pearson)
4. Albaum Duerr - International Marketing and Export management (Pearson, 7th Ed.)

Websites:

www.ibef.org
www.cia.gov.in

Course Outcomes:

After going through the course, the student would be able to:

- ☐ Get an overview of the key issues and concepts of International Business
- ☐ Understand how and why the world's countries differ.
- ☐ Understand the monetary framework in which international business transactions are conducted
- ☐ Understand the role of International Organizations and Regional Trade blocks
- ☐ Implement the decisions for international operations in a superior manner

EMPLOYABLE SKILLS

Skill	Measurement Tool
Understanding of principles of International Business	Group assignment, Case study analysis
Develop reasoning abilities for applying the theoretical Knowledge	Group assignment, Case study analysis
Understanding of fundamentals of International Marketing, Finance & HRM	Group project, presentations
Critical thinking skills for understanding the role of International organizations and Regional Trade Blocks	Quiz, Debate, Case study analysis

CORPORATE GOVERNANCE, VALUES & ETHICS

Code: RMB 401

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To introduce the concept and importance of corporate governance
- ☐ To introduce the concept and importance of business ethics
- ☐ To know the facets of ethics management
- ☐ To know the ethical values and Indian ethos in Management.

Unit I **(6 hours)**

Issues, need of corporate governance code, Code of Corporate Practices, Social Responsibility of Corporates, Corporate Social Reporting, Corporate Governance and the Role of Board(BOD), Corporate Governance System Worldwide, Corporate Disclosure and Investor Protection in
India.

Unit 2 **(8 hours)**

Code of Corporate Governance, Audit Committee, Corporate Excellence, Role of Independent Directors, and Protection of Stakeholders, Changing Roles of Corporate Boards with changing times, Corporate Social Responsibility.

Unit 3 **(8 hours)**

Moral Values and Ethics: Values – Concepts, Types and Formation of Values, Values of Indian Managers; Managerial Excellence through Human Values; Spiritual Values. Modern Business Ethics and Dilemmas, Conflict between personal values and organizational goals

Unit 4 **(8 hours)**

Business Ethics: Meaning, Definition, Nature, Importance.

Ethical Dilemma – Ethical Decision Making, Ethical Reasoning, Ethical issues, Ethics Management – Key roles and responsibilities, Benefits of Managing Ethics in Work Place, Code of ethics, Guidelines for developing code of ethics

Historical Perspective of Ethics – Plato, Aristotle, Benedict Spinoza, Immanuel Kant, Bhagwat Gita, Buddhism, Sufism, Capitalism, Marxism, Socialism, Utilitarianism

Unit 5 **(8 hours)**

Institutionalizing of Ethics, Traditional view, Contractual theory, Stake-holders' theory, The Regulatory and voluntary actions. Ethics and HRM, Ethics and Marketing, Ethics in Finance and Accounting, Ethical implications of Technology. Ethics and Information Technology.

Text books:

1. A C Fernando – Business Ethics & Corporate Governance, 2e, Pearson
2. Ghosh –Business ethics and corporate governance, McGraw-Hill
3. Kumar- Corporate Governance, Oxford University Press
4. Mandal – Ethics in business and corporate governance, 2e, McGraw-Hill

Reference Books:

1) S.S. Iyer - Managing for Value (New Age International Publishers, 2002)
2) Laura P Hartman Abha Chatterjee - Business Ethics (Tata McGraw Hill, 2007)
3) Mohapatra, Sreejesh- Case Studies in Business Ethics & Corporate Governance, 1e, Pearson

Websites: www.clearias.com/**corporategovernance**/
www.management**study**guide.com/**corporate-governance**.htm

Course Outcome:

After going through this course the studet will be able to:

- ☐ Have an insights into various concepts & cases related to Corporate Governance
- ☐ Gain a deeper understanding of the various aspects, factors related to role of ethics in Business.

EMPLOYABLE SKILLS

Skill	**Measurement tool**
Understanding of principles of Industrial Relations	Group assignment, Case study analysis
Develop reasoning abilities for applying the theoretical Knowledge	Group assignment, Case study analysis
Understanding of fundamentals of the relevant legal laws	Group project, presentations
Develop a suitable legal operational framework.	Quiz, Debate, Case study analysis

ENTREPRENEURSHIP DEVELOPMENT

Code: RMB 402

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To provide basicunderstanding ofentrepreneurshipconcept, functions of entrepreneurs, and problems faced by them in the real world.
- ☐ To impart understanding of basic entrepreneurial skills and knowledge, and acquaint themwith special forms of entrepreneurial trends.
- ☐ To expose students to the entrepreneurial environment, creating awareness of business opportunities, and familiarizing them with formal practices in effective business plan formation.
- ☐ To provide insights to students on entrepreneurial opportunities, government support services and government policies.
- ☐ To familiarize students with SME sector activities, venture capital financing and international entrepreneurial opportunities.

Unit 1 **(8 Hours)**

Introduction: Meaning, definition and concept of entrepreneur, entrepreneurship and entrepreneurship development. Factors affecting entrepreneurship, characteristics and skills of an entrepreneur, entrepreneur v/s manager. Evolution of entrepreneur, Entrepreneurship, concepts of intrapreneurship, types of entrepreneurs, functions of entrepreneur, advantages of becoming an entrepreneur, entrepreneurial decision-process, challenges faced by entrepreneurs,common mistakes in entrepreneurship, and changing role of entrepreneur.Women enterprises, social, and rural entrepreneurship.

Unit 2 **(9 Hours)**

Entrepreneurial Finance, Assistance and Entrepreneurial Development Agencies: Estimating financial funds requirement; Sources of finance – banks, various financial institutions (including IFCI, ICICI, IDBI and SIDBI), financing of small scale industries in developing countries.

Role of central government and state government in promoting entrepreneurship with various incentives, subsidies, grants, export oriented units – fiscal & tax concessions, other government initiatives and inclusive entrepreneurial growth.Financing of small scale industries in developing countries.Overview of MSME policy of government in India.

Role of agencies assisting entrepreneurship: DICs, SSIs, NSICs, EDII NIESBUD, NEDB, Entrepreneurship Development Institute (EDI). New initiatives taken by government to promote entrepreneurship in India at larger scale.

Unit 3 (**8 hours)**

Developing Entrepreneurial Mind-set: Idea generation- sources and methods, identification and classification of ideas. Individual creativity: roles and process; idea to business opportunity. Entrepreneurial motivation, meaning of entrepreneurial competencies, major entrepreneurial competencies, developing entrepreneurial competencies. Opportunity assessment,business opportunities in various sectors, challenges of new venture start-up, reasons for failure; how to begin with low investment.

Unit 4 **(6 hours)**

Developing a Business Plan: Environmental Scanning and SWOT analysis, and. The business plan as an entrepreneurial tool, Business Planning Process: elements of business planning, preparation of project plan**,** components of an ideal business plan – market plan, financial plan, operational plan, and, Feasibility Analysis – aspects and methods: Economic-analysis, financial analysis, market-, and technological feasibility.

Unit 5 **(5 hours)**

Launching a New Venture: Steps involved in launching a business (Process charts), Various Forms of business ownership, Registration of business units; start-up to going IPO; revival, exit and end to a venture.

Text Books

1. Holt, David H., Entrepreneurship: New Venture Creation, Person.

2. Khanka, S.S.; Entrepreneurial Development; S. Chand and Co.

Reference Books

1. Kumar, Arya; Entrepreneurship; Pearson Education.
1. 2.Desai, Vasant; Dynamics of Entrepreneurial Development and Management; Himalaya Publishing

2. Blundel, R. and Lockett, N.; Exploring Entrepreneurship Practices and Perspectives; Oxford Publications.
3. Hisrich, D. Robert, Peters, Michael P. and Shepherd, Dean A.; Entrepreneurship; McGraw-Hill Education .
4. Dollinger, M. J.; Entrepreneurship: New Venture Creation; PHI Learning.

Course Outcome:

- There will be ability tounderstand the context of entrepreneurial activities so as to undertake them in due course of time.
- There will be ability tofocus on key strengths and potentials that students can convert into entrepreneurial competencies for their future careers.
- They shall be able toidentify future business opportunities indifferent business environments and plan a business process.
- They will be able toidentify and seek help from different levels and types of state and national level agencies.
- They will be able to apply their entrepreneurial capabilities in the SME sector, deploy knowledge of venture capital financing and exposure to international entrepreneurial opportunities.

Sn	Entrepreneurial skills	Measuring Tools
1	Project Report Preparation	Workshop, Discussion, & Exercise
2	Estimation of Enterprise Finance	Presentation of Financial Feasibility Report
3	New Idea Development and Commercialization	Discussion &Business Plan Presentation

Talent Management

Code: RMB HR 01

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- This course focuses on the attraction, acquisition, and retention of talent in organizations.
- In particular, the module will focus on the alignment of the talent management process with business strategy, with culture, and with people.
- Aim is to discuss the issues from two perspectives: managing talent in organizations as well as managing one's own talents as an individual.
- In addition, the course will cover the negotiation problems that managers may face in decision-making processes; for example, the hiring negotiation, the promotion negotiation, the firing decision, and HR-relevant cross-cultural negotiation issues.

Unit 1 **(6 hrs)**

Introduction to Talent Management: Introduction, Meaning & Objectives, Role of Talent Management in building sustainable competitive advantage to a firm, Key Processes of Talent Management, Recruitment, Selection, Human Resource Planning, Retention, Talent vs. knowledge people, Source of Talent Management, Consequences of Failure in Managing Talent, Some suggestive tools for Managing Talent.

Unit 2 **(8 hrs)**

Talent Acquisition: Job analysis-Method of collecting information, developing questionnaires, interviews, developing job description & job specification. Developing HR planning process (using MS-Excel and quantitative tools). Evaluation of factors affecting HRP, Strategic view of recruitment & selection. Talent Acquisition, Recruitment Process, Strategic Trends in Talent Acquisition, Talent acquisition management solutions.

Unit 3 **(7 hrs)**

Employee Engagement: Preparing recruitment plan, E-recruitment (using various job portals), searching & downloading applicant profile by using job portals, selecting recruitment source, preparing recruitment budget, employer branding, formulating a recruitment strategy (specifically for Managerial/Executive jobs),Selection process, Use of assessment centres, selection errors & minimising selection errors, Reliability & Validity tests, Choosing the types of interviews.

Unit 4 **(8 hrs)**

Employee Retention: Comprehensive approach to Retaining employees, Managing Voluntary Turnover, dealing with Job Withdrawal, Strategic Compensation plan for Talent Engagement, Defining the Elements of Total Rewards, Integrated Rewards Philosophy, Designing Integrated Rewards, Sustainable Talent Management and Reward Model.

Unit 5. **(7 hrs)**

Emerging Trends in HR: Human Resource Audits, Human Resource Information System (HRIS), Human Resource Accounting (HRA), Contemporary development, and Cultural development, Business Process Re-engineering, Contemporary Talent Management Issues and Challenges.

Employability Skills:

Functional Skills	Measurement
1. Laying foundation of critical thinking Skills	Cases+ Exercise
2. Developing students to strategically formulate talent management tools.	Exercise+ Case
3. Developing analysis of multiple perspectives of Talent Management	Case/Workshop
4. Developing an understanding of how to manage other people (i.e. their subordinates or peers) and themselves with regard to career-related issues.	Case

Text Books:

- ☐ Dessler Gary, A Framework for Human Resource Management, Pearson Publication, 7th Edition.
- ☐ Dessler Gary, Varkkey Biju, Fundamentals of Human Resource Management, Pearson Publication,14th Edition

References:

- ☐ Rao VSP, Human Resource Management, Vikas Publishing, New Delhi
- ☐ K.Aswathappa – Human Resources and Personnel Management, Tata McGraw Hill
- ☐ Robbins SP, Timothy A, Judge & Sanghi Seema, Organizational Behaviour, Pearson Education, New Delhi ,13th edition.
- ☐ Lance A Berger, Dorothy R Berger,Talent Management Hand Book, McGraw Hill
- ☐ Hasan, M., Singh, A. K., Dhamija, S. (eds.), Talent management in India: Challenges and opportunities, Atlantic Publication

Performance & Reward Management

Code: RMB HR 02
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives

- ☐ Articulate the benefits of using a performance development plan and the consequences of not having one in place.
- ☐ Distinguish the elements of an effective, integrated performance development system.
- ☐ Devise “SMART” annual performance objectives (e.g., objectives that are specific, measurable, attainable, relevant and track able).
- ☐ To familiarize the students with the concept of competency mapping and understanding its role in career development.
- ☐ To familiarize students with various aspects of compensation system in India and make them understand various issues linked with the process of fixing salary dearness allowance, bonus, incentive scheme and benefits.

Unit1: **(7 hours)**
Introduction to Performance Management System
Meaning, Uses and purpose of performance management, how it differs from performance appraisal, Performance management and its challenges in current scenario, Performance management as a system and process, Establishing performance criterion of developing an effective appraisal system, Criteria (KRA, KSA VS KPI), why performance appraisal,

Unit2: **(6 hours)**
Managing Performance Methods of managing performance of all the levels of management- 360 degree performance appraisal, MBO and, Performance analysis for Individual and organizational development,

Unit3: **(6 hours)**
Contemporary Issues Potential appraisal, competency mapping & its linkage with career development and succession planning, Balance score card- advantages and applications.

Unit 4: **(7 hours)**
Reward System Compensation- Definition, Function, significance. Job evaluation, methods of job evaluation, inputs to job evaluation, its practical implication for technical/non technical and executive/managerial positions, and significance of wage differentials.

Unit 5: **(7 Hours)**
Compensation: Method of pay and Allowances Pay structure: Basic Pay, DA, HRA, Gross Pay, Take home pay etc. Methods of payments- Time and piece rate. Fringe benefits & other allowances- overtime, city compensatory, travelling etc. Overview of minimum wages Act- 1948 and Equal Remuneration Act-1976. Regulatory compliance including wage and pay commissions, incentive scheme-individual, group, profit sharing- co-partnership- stock option: ESOP, welfare Measures- Statutory & non- Statutory, social security schemes- ESIS, PF, Pension, Insurance, Gratuity and Maternity Benefits.

Unit 6: **(7 Hours)**
Practical: Preparation of pay roll on excel sheet for executive and managerial position. New practices of compensating employees. (Eg flexi wage system) (3 hours)

Course Outcome

1. Students will be able to explain the concept of performance management system and its relevance in the organization.
2. They have the ability to explain the different methods adopted by the organizations and different methods used for different level of employees.
3. They have the ability to explain the relevance of competency mapping and understanding its linkage with career development.
4. Students will be able to explain how to prepare pay roll on excel and also various aspects of compensation system in India.

Employability skills

Skills	**Measuring Tools**
Ability to integrate employee performance to business performance	Exercises
Preparing Pay roll	Workshop, Exercise
Developing performance appraisal form and performance standards	Exercises

Reference Books:

1. Michael, Armstrong (1999). Performance Management. Kogan Page.
2. Chadha, P. (2003). Performance Management: It's About Performing Not Just Appraising. McMillan India Ltd.
3. Performance Management: Robert Bacal, McGraw-Hill Education, 2007

Text Book:

1. Performance Management and Appraisal Systems: HR Tools for Global Competitiveness by T.V. Rao. New Delhi, Response Books, 2007.

Magazines

ICFAI Journals
Business Manager
People Matters

Websites:
www.shrm.org

INDUSTRIAL RELATIONS & LABOR LAWS

Code: RMB HR 03
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To Provide conceptual framework of Industrial Relation
- ☐ To make students aware with the Indian Labour legislation
- ☐ To make students aware with the basic requirements and mandate of labour legislations

Unit 1:
Introduction: Concept, objectives, functions, significance & aspects of Industrial Relations Emerging challenges of IR in India, Linking Industrial Relations with economic growth of a country, Trade Unionism: Development of trade unionism, functions, type and structure, problems & suggestive remedial measures of trade unions, The Trade Unions Act 1926- objectives, recognition and registration, Industrial Democracy & Participative Management

Unit2:
Collective Bargaining: Significance, types & Procedure of collective bargaining Discipline: The Industrial Employment (Standing Orders) Act 1961, Misconduct, Disciplinary Action, Types of punishments, Code of Discipline, Domestic Enquiry, Grievance Function in IR: Grievance Settlement Procedure, Industrial Disputes: Preventive & Settlement Machinery in India

Unit 3
The Factories Act, 1948 & The shop & Establishment Act 1948
The Payment of Wages Act, 1923
The Workmen's compensation Act, 1972
The Industrial Disputes Act, 1947

Unit 4
The Payment of Minimum wages act 1936
The Contract Labor (Abolition & regulative) act
The ESI Act, 1948
The Trade unions act, 1926

Unit 5
The payment of Bonus Act, 1965 The payment
of Gratuity Cat, 1972 The Maternity Benefit
Act, 1961
Employee's Provident fund & Miscellaneous Provisions Act, 1952
.

Text Books:

3. Mamoria CB, Mamoria, Gankar - Dynamics of Industrial Relations (Himalayan Publications, 15th Ed.)
4. Singh B.D. - Industrial Relations & Labour Laws (Excel, 1st Ed.)

Reference Books:

1. Srivastava SC - Industrial Relations and Labour Laws (Vikas, 2000, 4th Ed.)
2. Venkata Ratnam – Industrial Relations (Oxford, 2006, 2nd Ed.)
3. Monappa Arun, Industrial Relations

Websites:

www.labour.nic.in
www.hrmguide.net

Skills	**Measuring Tool**
Ability to identify the mandate (about dates) of the laws	Exercise + workshop
Ability to identify the mandate (Forms) of the laws	Class room discussions
Ability to have a safeguard from the penalty imposed on employer due to Legislation	Exercise + workshop

Training & Development

Code: RMB HR 04

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective: The course aims at exposing the learner to the Concept and practice of training and development in the modern organisational setting through the pedagogy of case discussions and recent experiences. The design of the course aims to provide an experimental, skill- based exposure to the process of planning, organizing and implementing a training system.

Unit I **(6 Hours)**
Introduction: Concepts and Rationale of Training and Development; Difference between Training, Development & Education, overview of training and development systems; organizing training department; training and development policies; linking training and development to company's strategy; Requisites of Effective Training ;
Role of External agencies in Training and Development.

Unit II **(6 Hours)**
Training Needs Assessment (TNA): Meaning of TNA, Purpose and Methods of TNA, TNA at different levels, the Need Assessment Process – Organizational Analysis, Person Analysis, Task Analysis, Output of TNA.

Unit III **(8 Hours)**
Learning Theories and Program Design: Introduction to learning, Learning Theories – Reinforcement Theory, Social Learning Theory, Goal Theory, Need Theory, Expectancy Theory, Information Processing Theory, Process of Learning, Consideration in designing effective training programs, organizational learning vs. Learning organization.

Unit IV **(8 Hours)**
Designing, Conducting & Evaluation of Training Program: Areas of training, Types of training, System's Approach to Training, Training Methods, Make or Buy Decision, Designing a training program, contents & scheduling, study material, selecting a trainer, deciding method of training, Costing & Training Budget, Types of Teaching Aids in Training, Training Evaluation & Methods of Training Evaluation, Training Effectiveness Models - Kirkpatrick Model of Training Effectiveness, CIRO Model.

Unit V **(8 Hours)**
Executive Development: Importance of Executive Development, Steps in the organization of a management Development Program/ Executive Development Program, Methods/ Techniques of Management Development Program, Training & Development in Indian Industry, Special Issues in Training & Development – Legal Issues, Cross Cultural Preparation, Managing Workforce Diversity, Sensitivity Training, Succession Planning.

Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	**Exercise** **Workshop** **Quiz** **Classroom Discussions**

Course Outcomes:

After successful completion of the course, the students must be in a position to address:

- ☐ The field of Training and Development and its role in optimizing performance.
- ☐ Applying theoretical concepts and models to training design.
- ☐ Designing training interventions using a variety of methodologies.
- ☐ Evaluating the effectiveness of training & development interventions.
- ☐ Assessing whether training & development is a viable career option.

Refrences:

Books:

1. Noe, Raymond A., and Amitabh Deo Kodwani, Employee Training and Development, Tata McGraw Hill, 5th Edition, 2012.
2. Rao VSP, Human Resourse Management, Excel Books Publication, 3rd Edition. 2013.
3. Rolf, P., and Udai Pareek, Training for Development, Sage Publications Pvt. Ltd.
4. Blanchard, P. Nick, James W. Thacker and V. Anand Ram, Effective Training: Systems, Strategies, and Practices, Dorling Kindersley (India) Pvt. Ltd.
5. Jack J. Phillips, Hand book of Training Evaluation and Measurement Methods, Routledge.
6. Dayal, Ishwar, Management Training in Organisations, Prentice Hall.

Negotiation & Conflict Management

Code: RMB HR 05

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective: To familiarize the learners with the dynamics of collective bargaining in the industrial relations environment in the country and to impart them relevant skills in effective negotiations so as to help in managing unions effectively. .

Unit I **(8 Hours)**

Conflict: Meaning and Source of Conflict, Types of conflict, patterns, levels, and; traditional and modern approaches to conflict; Functional and dysfunctional conflicts; Conflict Process, Management of conflict – Resolution & Stimulation Techniques, Dual Concern Model of Conflict Resolution

Unit II **(6 Hours)**

Dealing with Conflict: Four myths about conflict, Team Conflict, Understanding individual styles for handling Inter Personal Conflict, Cross – Cultural differences in Approaches to Conflict, Importance of Emotional Intelligence.

Unit III **(8 Hours)**

The Negotiation Process – Gaining leverage through power & persuasion:

Elements of Negotiation, Multiparty Negotiations, Stages of Negotiation Process; Levels of Negotiation; Issues for Negotiation; Preparation for Negotiations, Types, strategies and tactics in negotiation. Bargaining & Negotiation: Differences and similarities. BATNA, Context of Mediation, Conciliation, Arbitration; Principles of persuasion; Persuasion Strategy and its effectiveness.

Unit IV **(8 Hours)**

Negotiation Skills for Effectiveness: Need for developing Negotiation skills, Breakdown of Negotiation: Causes and Consequences; Third Party Intervention, Impasse and Alternative Dispute Resolution (ADR), What causes Impasse and Intractable Negotiations, characteristics that make a Negotiation more intractable, Effective Negotiation: Mutual Trust and Understanding; Challenges for effective negotiators..

Unit V **(6 Hours)**

The influence of culture and gender on negotiations: Understanding cultural differences in negotiation; Hofstede’s Cultural Dimensions, GLOBE study on cultural dimensions, Gender issues in negotiations; role of cross-cultural differences in Negotiations; Seven pillars to negotiational wisdom. International Negotiations, Best practices in negotiations.

Skills	Measuring Tools
Ability to identify and apply the knowledge of subject practically in real life situations	Exercise Workshop Quiz Classroom Discussions

Course Outcome:

- ☐ Understanding the central concepts of negotiation and conflict.
- ☐ Providing experience in the negotiation and conflict management process.
- ☐ Effectively diagnosing and planning for different types of negotiation situations.
- ☐ Developing negotiating skills and confidence in a variety of contexts.

References:

Books:

1. Carrell. R. Michael & Heavrin Christina Heavrin, Negotiating Essentials: Theory, Skills, and Practices, Pearson Education New Delhi, 2008
2. Lewicki J. Roy, Saunders M. David, Berry Bruce, Negotiation, Mc Graw Hill, 5^{th} Edition, 2011.
3. Cohen, S. Negotiating Skills for Managers. McGraw Hill Professional
4. Bray M, Deery.S, Walsh.J, and Waring P, Industrial Relations: A Contemporary Approach, Tata Mc Graw Hill.
5. Udai Pareek: Understanding Organizational Behaviour, Oxford Press

Websites:

http://www.skillsyouneed.com/ips/negotiation.html

http://www.skillsyouneed.com/ips/conflict-resolution.html

Sales & Distribution Management

Code: RMB MK 01
Course Credits: 3 **Teaching Hours: 36 Hrs**

Objectives:

- ☐ To build knowledge, understanding, and skills in Sales and Distribution management.
- ☐ Enable development and implementation of Sales and Channel management strategies.
- ☐ Help analyze decision alternatives and criteria in the context of realistic problem situations in Sales and Channel management.

UNIT 1: **(5 Hours)**
Introduction to Sales Role of selling in marketing, Personal selling, Salesmanship and sales manager, Types of sales personnel, Characteristics of a successful salesman, Theories of selling, Process of effective selling.

UNIT 2: **(5 Hours)**
Building Sales Organization Types of sales organizations and their structure, Functions and responsibilities of sales person, filling sales positions, Recruitment, Selection, Training and Development.

UNIT 3: **(9 Hours)**
Leading Sales Organization Sales force motivation, Sales force compensation, Designing incentives and contests, Sales forecasting, Sales budget, Sales quota, Sales territory, Building sales reporting mechanism and monitoring, Sales force productivity, Sales force appraisal.

UNIT 4: **(9 Hours)**
Channel Planning Marketing channels, Structure and functions, Marketing channel design, Service output, Supply side channel analysis, Channel flow and efficiency analysis, Channel structure and intensity analysis, Forward and reverse logistics, Gap analysis.

UNIT 5: **(8 Hours)**
Managing the Marketing Channels Channel incentives and margins, Channel power, Managing channel conflict, Motivating channel members, Channel coordination, Strategic alliances, Vertical integration, Overview of retailing, Wholesaling and franchising.

Text Books

1. Spiro, R.L., Stanton, W.J.and Rich, G.A.; *Management of Sales Force*; McGraw-Hill Education
2. Havaldar, K.K., and Cavale, V.M.; *Sales and Distribution Management*; McGraw-Hill Education

Reference Books

1. Still, R.R., Cundiff, E.W. and Govani, N.A.P.; *Sales Management*; Pearson Education
2. Coughlan, A. T., Anderson, E., Stern, L. W. and El-Ansary, A. I.; *Marketing Channels*; Pearson Education
3. Panda, T.K., and Sahdev, S.; *Sales and Distribution Management*; Oxford University Press
4. Futrell, C.M.; *Sales Management*; Cengage Learning
5. Rosenbloom, B.; *Marketing Channels*; Cengage Learning

Course Outcomes:

- Students will develop the skills in Sales force management and Distribution Channel management.
- Acquainted with better understanding of implementation of Sales and Channel management strategies.
- Develop analytical skills for effective decision alternatives in Sales and Channel management problems.

CONSUMER BEHAVIOUR

Code: RMB MK 02
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES

At the conclusion of this course, the student should be able to:

- ☐ Define external influences on buying behavior (culture, demographics, social status, reference groups, purchasing groups, management influence).
- ☐ Define internal influences on buying behavior (belief, attitude, perception, preference, personality, and emotions).
- ☐ Explain the decision making process and how it relates to consumers and industrial buyers.
- ☐ Understand the self-concept and lifestyle and their influences on purchasing decisions.
- ☐ To apply consumer theories to the real marketing context.

UNIT-I INTRODUCTION TO CONSUMER BEHAVIOR (8 hrs)

Introduction to Consumer Behaviour; Applications of consumer behaviour knowledge in marketing. Contributing disciplines and area like psychology, social psychology, economics, anthropology etc. Consumer Behavior in the Contemporary Environment: Changing face of consumer behavior under the scenario of globalization, technological changes, new retailing environment, etc. Consumer behavior in electronic markets: opportunities, issues and challenges.

UNIT-II CONSUMERS AS INDIVIDUALS (8 hrs)

Personality in Consumer Behavior: Aspects of Personality & Impact on Consumer Behavior. Personality Theories. Consumer Personality & Brand Personality, Self Concept – Types & Applications. **Consumer Needs & Motivation:** Needs & Wants, Motives, Maslow’s Needs & Consumer Behavior. **Consumer Perception:** Perception Process & Involvement, Sensation & Sensory Thresholds, Selective Perception, Common Perceptions of Colours, Interpretation – Semiotics. Perceived Risk. Perceptual Positioning & Perceptual Mapping. **Consumer Attitude Formation & Change:** Attitude functions. Tri component attitude model, hierarchies of attitude components. Multi attribute attitude models. Changing consumer attitudes. **Consumer Learning:** Applications of behavioral learning theories and cognitive learning theories to consumer behavior.

UNIT-III CONSUMERS IN THE SOCIAL CONTEXT (8 hrs)

Reference Groups: Consumer socialization process. Types of reference groups, their nature of power & influence. Effect of reference groups on product & brand purchase. Opinion leaders – their role & types. Identifying opinion leaders. **Family, Gender & Age Influences:** Family decision making roles. Role of gender and age in family decision making. Family life cycle and consumer decisions. **Social Class & Consumer Behavior:** Social class – its components & impact on consumer behavior. India’s socio economic classification. Influence of social mobility on consumer behavior. **Cultural Influences on Consumer Behavior:** Characteristics of culture, application of cultural learning & rituals in consumer behavior. Types of subcultures in the Indian context. Cross-cultural influences. Cultural lessons in international marketing.

UNIT-IV CONSUMER DECISION MAKING (6 hrs)

Types of decision making & involvement. Information search pattern & marketing strategy. Types of choice models – multi attribute, conjunctive, disjunctive, lexicographic & elimination by aspects. Modeling consumer decision making – Howard Sheth model, Nicosia model and Engel Blackwell Miniard model.

UNIT-IV CONSUMER POST-PURCHASE BEHAVIOR (6hrs)

Post-Purchase Behavior: Satisfaction/dissatisfaction – loyalty/nonuse or complaint behavior. Post purchase dissonance – causes and approaches to reducing the same. Measuring satisfaction, handling complaints, achieving customer loyalty. **Organizational Consumer Behavior:** Organizational buying roles, buying situations & buying processes. Influences on organizational buying behavior.

Text Books:

1. Consumer Behavior, Schiffman, L. G. and Kanuk, L. L., Pearson.

Reference Books

1. Consumer Behavior, Hawkins et al., McGraw Hill.
2. Consumer Behavior, Blackwell et al., Thomson.
3. Consumer Behavior, Solomon, Prentice Hall.
4. Consumer Behavior, Concepts & Applications; Loudon, David / Bitta, Albert Della, Tata Mc Graw Hill.

EMPLOYABLE SKILLS:

Skill	**Measurement tool**
Understanding of consumer as Individual	Quiz, role play followed by class discussion
Understanding of consumer in group/society	Role play, presentations
Understanding of consumer decision making and post-purchase behavior	Case study analysis, group project

COURSE OUTCOMES

- ☐ Understand the three major influences on customer choice: the process of human decision making in a marketing context; the individual customers make up; the environment in which the customer is embedded;
- ☐ Develop the cognitive skills to enable the application of the above knowledge to marketing decision making and activities
- ☐ Be able to demonstrate how concepts may be applied to marketing strategy

DIGITAL MARKETING

Code: RMB MK 03

Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To help students understand digital marketing practices, inclination of digital consumers androle of content marketing.
- ☐ To provide understanding of the concept of E-commerce and developing marketing strategies in the virtual world.
- ☐ To impart learning on various digital channels and how to acquire and engage consumers online.
- ☐ To provide insights on building organizational competency by way of digital marketing practices and cost considerations.
- ☐ To develop understanding of the latest digital practices for marketing and promotion.

Unit 1 **6 hours**

Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world - latest practices.

Unit 2 **9 hours**

E-Commerce and Internet Marketing: Introduction to E-marketing, online marketing-mix, online consumer, customer relationship management in the virtual world, online branding, traffic building and E-commerce, Managing content in a digital age – content planning and writing. Consumer buying behaviour in the digital-age, and factors affecting consumer behaviour.

Unit 3 **8 hours**

Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search marketing, mobile marketing, video marketing, and social-media marketing. Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).

Unit 4 **7 hours**

Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies

Unit 5 **(6 hours)**

Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation, future of marketing gamification and apps.

Text Books

1. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
2. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional (October, 2013).
3. David Whiteley; E-Commerce: Strategy, Technologies and Applications, Mcgraw Hill Education.

Reference Books

1. Menon, Arpita; Media Planning and Buying; McGraw Hill (1^{st} Edition, 2010)
2. Arnold, George; Media Writer's Handbook: A Guide to Common Writing and Editing Problems; McGraw-Hill Education; (5^{th} edition, 2008)
3. Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page (3^{rd} Edition, 2014).

Expected Course Outcomes:

- ☐ It will develop proficiency in interpreting marketing strategies in the digital age and provide fundamental knowledge for working in an online team.
- ☐ It will enable them to develop various online marketing strategies for various marketing-mix measures.
- ☐ It will guide them to use various digital marketing channels for consumer acquisition and engagement.
- ☐ It will help in evaluating the productivity of digital marketing channels for business success.
- ☐ It will prepare candidates for global exposure of digital marketing practicesto make them employable in a high growth industry.

MARKETING OF SERVICES

Code: RMB MK 04
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES

- ☐ To develop an understanding of the basic concepts and issues in service marketing.
- ☐ To build a working service marketing vocabulary so as to understand and discuss marketing concepts in business settings.
- ☐ To learn about key characteristics of service and service processes, customer service experiences, the role of internal stakeholders in service delivery, and organizational challenges of managing service.
- ☐ To strengthen the ability to justify and support decisions through information acquisition and management.
- ☐ To provide an understanding of how service customers determine value in a service exchange and how this translates into a satisfied customer base.

UNIT- 1 INTRODUCTION TO SERVICES MARKETING (8 hrs)

Introduction: Definition, Characteristics and Classification of Services, Difference between Product and Services Marketing, Paradigms in Services Marketing, Present Marketing Environment, **Services Marketing Mix:** Understanding the 7 P’s, **Strategies for Services Marketing:** Segmentation, Targeting & Positioning, Differentiation.

UNIT- 2 UNDERSTANDING CONSUMER BEHAVIOR AND SERVICE DESIGN (7 hrs)

Understanding Consumer Behavior: Services vis-à-vis goods, Consumer Behavior in Services, Customer Expectations and Perceptions of Services – Evaluation of services. **Service Development Design & Standards:** New Service Development Process – Basic service to potential service, Customer Defined Service Standards, Demand and Capacity Management.

UNIT- 3 DELIVERING, PRICING AND MANAGING SERVICE PROMISE (7 hrs)

Delivering Services: Role of Employees and Customers in service delivery; Role of Intermediaries, Service process – Blue printing – Physical evidence. **Pricing of Services:** Pricing Considerations and Strategies, Revenue Management. **Managing Service Promise:** Role of Advertising, Personal Selling, Sales Promotion, Publicity and Public Relations.

UNIT- 4 SERVICE PERFORMANCE (7 hrs)

Evaluating Success of Service Offering: Service quality and measurement, Complaint handling, Recovery management, Service Guarantees. Role of CRM, The Gaps Model Of Service Quality.

UNIT – 5 OVERVIEW OF CURRENT TRENDS IN SERVICE INDUSTRIES (7 hrs)

Understanding of Current Trends in Service Industries: Financial, Hospitality, Health, Telecom, Consultancy, Logistics, Education, NGO, Public Utilities, ITES (IT enabled Services), Travel & Tourism, e-Services and Professional Services.

Text Book

1. Services Marketing, Zeithaml Valerie and Mary Jo Bitner, Gremler & Pandit, Tata McGraw Hill.

Reference Books

1. Services Marketing, Lovelock, Christopher. PrenticeHall.
2. Services Marketing, Nargundkar, Rajendra. Tata McGraw Hill.
3. The Essence of Services Marketing, Adrian Payne. PHI.
4. Services Marketing, Ravi Shankar. Excel Publishing

COURSE Outcome

- ☐ Understand and explain the nature and scope of services marketing;
- ☐ Use critical analysis to perceive service shortcomings in reference to ingredients to create service excellence;
- ☐ Be able to identify critical issues related to service design, such as identifying and managing customer service experience, expectations, perceptions and outcomes
- ☐ Provide a theoretical and practical basis for assessing service performance using company examples;
- ☐ Identify and discuss characteristics and challenges of managing service firms in the modern world
- ☐ Discuss key linkages between marketing and other business functions in the context of designing and operating an effective service system.

EMPLOYABLE SKILLS

Skill	**Measurement tool**
Understanding of	Presentations, Quiz
fundamentals of services	
Understanding of consumer	Role Play followed by discussion
behavior in services	
Designing and delivering	Group assignment, Case study analysis
Services	
Service quality measurement	Group project, presentations
Service performance analysis	Quiz, Debate, Case study analysis

Integrated Marketing Communication

Code: RMB MK 05
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES : The objectives of this course .

- ☐ To provide an understanding of integrated marketing communications (IMC) and its influences on other marketing functions and other promotional activities.
- ☐ Help to understand what advertising is and its role in advertising and brand promotion.
- ☐ Understand the importance of message design and the creativity involved in message designing.
- ☐ Understand the concept of international advertising and media planning and strategy.
- ☐ Help in exploration of tools of promotion like sales promotion , publicity, public relation etc.

UNIT 1 **(5 hours)**

Marketing Communication: Objectives of Marketing Communication, Functional areas of marketing communication. Integrated Marketing Communication (IMC): concepts and process , Factors contributing to IMC, Role of IMC in branding, IMC Partners, Promotion Mix, Integrating IMC in Marketing Mix ,Challenges in IMC,.

UNIT 2 **(9 Hours)**

Advertising Management: Meaning, Nature and Scope of Advertising, Classification of advertising, Process of Advertising, STP Strategies for Advertising , Communication Model with reference to Advertising, AIDA. Advertising campaigns , Fundamentals of Advertising Campaigns, The Creative Brief ,Big Idea, Getting Creative to find the Big Idea, , Advertising Appeal. Advertising Agencies – their role, functions, organization, Compensation, client agency relationship, Management of Advertising Agencies.

UNIT 3 **(8 Hours)**

Ad Budget , Ad Appropriation .Methods of Budgeting .Measuring Effectiveness of Advertisement , Legal and Ethical concepts and issues in Advertising, Advertising Research. Message Design-The Creative concept development; the creative processes of the different forms of IMC; Source of the message, Message integration

UNIT 4 **(8 Hours)**

International advertising and promotion: global vs local advertising, decision areas in international advertising, role of promotional mix elements in international marketing Media Planning and Strategy - Media Types and their characteristics; Setting Media objectives; Steps involved in media planning, ; Media Strategy; Cross media concept; and media research.

UNIT 5 **(6 Hours)**

Emerging Concepts and Issues in Marketing Communications: Programmatic, native advertsing, video, mobile, digital , Sponsorship, Role of E-Commerce in Marketing Communication. Corporate advertising , Advertorials and Infomercials. Public Relations – Types & Tools of PR, Sales Promotion – Different types of Sales Promotion, Publicity – Types of Publicity, Personal Selling, Direct marketing, Event Management, Unconventional Promotional methods

COURSE OUTCOMES:

Upon completion of the subject, students will be able to:

- ☐ apply an IMC approach in the development of an overall advertising and promotional plan
- ☐ able to prepare marketing communication budget.
- ☐ enhance creativity, critical thinking and analytical ability through developing an integrated marketing communication campaign
- ☐ create an advertising strategy that employs an appropriate message objectives.
- ☐ develop insights into the characteristics of different forms of marketing communications such as advertising, sales promotions, public relations, point-of-purchase communications.

TEXT BOOK

1. Kruti Shah & Alan D' Souza :Advertsing & promotions an IMC perspective- Mc Graw Hill education
2. George E Belch & Michael A Blelch : Advertising and promotion- An integrated Marketing Communication Perspective-Mc Graw Hill Education
3. Siraj M Joseph & Rahtz Don R : Integrated Marketing Communication – A Strategic Approach, engage Learning
4. Kenneth Clow & Donald Baack : Integrated Advertising, Promotion, and Marketing Communications, Pearson Education, Limited
5. Borden & Marshall : Advertising Management; MV Taraporevala Sons' Co Pvt. Ltd, Richard D Irwin Inc. Homewood, Illinois

REFRENCE BOOK

1. Chunawala & Sethia : Foundations of Advertising Theory & Practice; Himalaya Publishing House

2. Copley Paul : Marketing Communications Management Concepts & theories, Cases and Practices; Butterworth Heinemann Publication

3. Duncon : Integrated Marketing Communications, Tata McGraw Hills

Skills	**Measuring tool**
Development of overall promotional plan	Case study + Workshop
Preparation of advertising budget	Case study + Workshop
Appropriate message designing	Case study + Workshop

Elective: Finance

Security Analysis & Portfolio Management

Code: RMB FM 01
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVE:
This course will emphasize an understanding of the economic forces that influence the pricing of financial assets.

- Understanding of investment theory will be stressed and tied in with discussion of applicable techniques such as portfolio selection.
- The course material will cover formulae that can be applied in different business situations regarding active portfolio management.
- To expose the students to the concepts, tools and techniques applicable in the field of security analysis and portfolio management.
- To provide a theoretical and practical background in the field of investments.

Unit I Investment (08 Hrs)
Overview of Capital Market: Market of securities, Stock Exchange and New Issue Markets - their nature, structure, functioning and limitations; Trading of securities: equity and debentures/ bonds. Securities trading - Types of orders, margin trading, clearing and settlement procedures. Regularity systems for equity markets, Type of investors, Aim & Approaches of Security analysis.

Unit II Portfolio Theory (10 Hrs)
Risk & Return: Concept of Risk, Component & Measurement of risk, covariance, correlation coefficient, Measurement of systematic risk. Fundamental Analysis: Economic, Industry, Company Analysis, Portfolio risk and return, Beta as a measure of risk, calculation of beta, Selection of Portfolio: Markowitz's Theory, Single Index Model, Case Studies.

Unit III Capital Market & Asset Pricing (06 Hrs)
Technical Analysis: DOW Theory, Support and Resistance level, Type of charts & its interpretations, Trend line, Gap Wave Theory, Relative strength analysis , Technical Versus Fundamental analysis. Nature of Stock Markets: EMH (Efficient Market Hypothesis) and its implications for investment decision. Capital market theorem, CAPM (Capital Asset Pricing Model) and Arbitrage Pricing Theory. Case Studies.

Unit IV (08 Hrs) Bond, Equity and Derivative Analysis : Valuation of Equity Discounted Cash-flow techniques: Balance sheet valuation, Dividend discount models, Intrinsic value and market price, earnings multiplier approach, P/E ratio, Price/Book value, Price/sales ratio, Economic value added (EVA). Valuation of Debentures/Bonds : nature of bonds, valuation, Bond theorem, Term structure of interest rates.

Unit V Active Portfolio Management (08Hrs)
Portfolio Management and Performance Evaluation: Performance Evaluation of existing portfolio, Sharpe, Treynor and Jensen measures; Finding alternatives and revision of portfolio; Portfolio Management and Mutual Fund Industry

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SUGGESTED READINGS :

Text Books :

1) Ranganatham - Security Analysis and Portfolio Management (Pearson Education, 2nd Ed.)
2) Chandra P - Investment Analysis and Portfolio Management (Tata Mc Graw Hill, 3rd Ed)
3) Bhatt- Security Analysis and Portfolio Management (Wiley ,1st Ed)
4) Pandian P - Security Analysis and Portfolio Management (Vikas, 1st Ed.)
5) Bodie, Kane, Marcus & Mohanti - Investment and Indian Perspective (TMH, 10th Ed)

Reference Books

1. William F. Sharpe, Gordon J.Alexander and Jeffery V.Bailey: Investments, (Prentice Hall, 6th Ed).
2. Donald E. Fischer and Ronald J.Jordan: Security Analysis and Portfolio Management, (Pearson Education, 6th Ed)
3. Charles P. Jones, Investments Analysis and Management, (John Wiley & Sons, 13th Ed) ..
4. Edwin J. Elton, Martin J. Gruber: Modern Portfolio Theory and Investment Analysis, 9/e, John Wiley & Sons, 2001.
5. Sidney Cottle, Roger F. Murray, Frank E. Block, Graham and Dodd: Security Analysis, 5/e, Tata McGraw-Hill, New Delhi, 2002.

Course Outcome:

After completing this course , one is able to know how to:

- ☐Value assets such as stocks and bonds.
- ☐Manage investment portfolios.
- ☐Optimally diversify portfolios.
- ☐Allocate investments into stock and bond portfolios in accordance with a person's risk preferences.
- ☐Measure the riskiness of a stock or a portfolio position.
- ☐Adjust the value of an asset to take into account the riskiness of the asset.
- ☐Understand and critically evaluate investment advice from brokers and the financial press.

Mandate to have basic knowledge about NSE and	Glossary at BSE & NSE
BSE	Site
Mandate to have some analytical ability to analyze various portfolios	Exercise +Cases
Mandate to have various mock exercises	

www.moneycontrol.com www.Valueresearch.com www.Yahoofinance.com

Tax Planning& Management

Code: RMB FM 02
Course Credits: 3 **Teaching Hours: 40 Hrs**

COURSE OBJECTIVE:

- ☐ The present course aims at familiarizing the participants with the principles, problems and structure of different types of business taxes in Indian
- ☐ Acquaint about the relevance of direct and indirect taxes in taking business decisions.
- ☐ A broad understanding or role of taxation in economic and industrial development of an economy
- ☐ A student of taxation will have to make a detailed study of tax policy and tax in India.

Unit I Introduction **(8 Hours)**

Definition: Cannons of Taxation Person, Assesse , Income, Previous Year, Assessment Year,Income Tax Important Dates and Forms. Tax Avoidance, Planning, & Evasion ,Residential Status & Tax Incidence: Individual Income Exempted from Tax , Income Tax Authorities- Their appointment- Jurisdiction- Powers and functions- Provisions relating to collection and recovery of tax- Refund of tax, appeal and revision provisions, offences and penalties.

Unit II Heads Of Income **(10 Hours)**

Computation of taxable income, Carry-forward and set-off of losses for companies,

Heads of Income – Salaries, Income from House Property, Profits & Gains from Business or Profession, Capital Gains, Income from Other sources., Clubbing of incomes, Calculation of Taxable Income ,Tax Calculation including Surcharge and Marginal relief,Deduction, Rebate, Relief, Set Off & Carry Forward of Losses – Principles, Meaning, Inter – sources & Inter – head Set Off.

Unit III Corporate Tax **(8 Hours)**

Computation of taxable income, Carry-forward and set-off of losses for companies, Minimum Alternative Tax (MAT), Set-off and Carry-forward of Amalgamation Losses, Tax Planning for Amalgamation, Merger and Demerger of Companies, Tax Provisions for Venture Capital Funds

Unit IV Central Excise Act, 1944& Sales Tax **(8 Hours)**

Basics of Excise duty : Broker or Commission Agent, Central Excise Officer, Goods &Excisable Goods, Factory, Manufacture, Types of Excise duty, Excise Rates, Conditions for imposing Central Excise, Calculation of Excise duty, Provisions and procedure dealing with registration and clearance of goods- An overview of set-off of duty schemeCENEVAT,MODVAT and VAT, An Introduction to GST.

Unit V Custom Act ,1962 **(6 Hours)**

Customs Act 1962 and customs Tariff Act 1975, Basics of Custom Duty , Types of Custom Duty, Calculation of Custom Duty, Special Economic Zones,Principles governing levy and exemptions from customs duties – Classification and valuation of goods, provisions governing import and export of goods, Overview of law and procedure - Clearance of goods from the port, including baggage- Goods imported or exported by post, and stores and goods in transit- Duty drawback provisions

SUGGESTED READINGS :

Text Books :

1. Dr. Vinod K. Singhania& Dr. Monica Singhania Students Guide to Income Tax (Taxmann Publication ,Latest Edition according to assessment year)

2. Dr.B.K. Agarwal& Dr. Rajeev Agarwal Tax Planning and Management(NirupamPublication,Latest Edition according to assessment year)
3. Paolo M. Panteghini Corporate Taxation in a Dynamic World (Springer, Latest Edition)
4. GirishAhuja& Ravi Gupta Direct Tax Laws & Practice (Bharat Law House, Latest Edition)

5. Datey V.S. - Indirect Taxes – Law & Practice (Taxman ,Latest Edition) 6.E. A. Srinivas Corporate Tax Planning(Tata McGraw Hill, Latest Edition)

Reference Books & Journals :

1. Dr.Vinod K. Singhania& Dr. KapilSinghania Students Guide to Income Tax (TaxmannPublication ,Latest Edition)

2. Parthasarathy Corporate Governance: Principles, Mechanisms & Practice (Wiley, Latest Edition)

3. H. P. Ranina Corporate Taxation (Orient Law House, Latest Edition) 4.Balachandran-Indirect Taxes (PHI, Latest Edition)

4. .Income Tax Reports, Company Law institute of India PvtLtd(Chennai Latest Edition)

5. 6Taxman, Taxman Allied SerivesPvt Ltd.(New DelhiLatest Edition)

Course Outcome:

- After completing this course , the scope of tax planning concerning various business and managerial and strategic activities can be explored
- Understand and critically evaluate their Tax and Tax planning
- Understand how Excise and Custom tax can be calculated.
- Measure Corporate Tax and Taxation in case of business restructuring
- Have knowledge about various Tax Dates, Rates and Forms.

Mandate to know about current income tax Rules	Income tax Rapidex, Current tax Reporter Jodhpur
Mandate to know about calculation of Income tax & various heads of Income	Cases + Exercise
Mandate to know about calculation of custom and excise rates	Exercise + Central Excise Tariff Act-1985 +Custom Tariff Act -1975

Financial Market and Commercial Banking

Code: RMB FM 03
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective:

- To impart knowledge of the financial system of India, the role of important financial institutions, financial markets and financial instruments.
- Familiarizing the students with the Indian Capital market, its operations, instruments regulations etc.
- Helping students in acquiring analytical skills in the market analysis in the in the context of raising medium and long term funds
- Familiarising the students with the operations of secondary market mechanism
- Developing an appreciation among the students for the Banking services and products.

SYLLABUS

UNIT I : Introduction **(3 Hours)**
Structure of Indian financial system: An overview. Theories of the Impact of financial development and savings; Prior saving theory, Credit creation Theory, Theory of forced savings, Financial regulation theory, Financial liberation Theory.

UNIT II: Financial Institutions **(11 Hours**

Reserve Bank of India: organization, management and functions, Recent monetary policy of RBI, Commercial banks: meaning, functions, present structure, types, e-banking and recent developments in commercial banking, NBFC, Sectorial financial institution NABARD, Exim Bank and PFC

UNIT III: Financial Markets (8 **Hours**)
Money and capital market, Money market: meaning, constituents, functions of money market, Money market instruments: call loans, treasury bills, certificates of deposits, commercial bills, trade bills, Recent trends in Indian money market, Capital market: primary and secondary markets, their role recent developments, Government securities market, SEBI: objectives and functions.

UNIT IV Financial Instruments and Foreign Investments **(7 Hours)**

An overview of Shares, Debentures, Bonds, Zero-coupon bonds, Deep-discount bonds, Warrants. Derivatives: futures, and options swaps, ADRs, GDRs, IDRs. Foreign Investments Trends and implications, Regulatory framework for foreign investments in India.
UNIT V: BANKING **(7 Hours)**

Banking role and structure of banking in India, Products and services: Credit card ,Debit card Smart card ,Internet banking , mobile banking, Demand and time deposits, Types of collateral Savings account ,current account(CASA), Third party products :Life Insurance ,Mutual fund, Equity ,General Insurance

Text Books

1. Bhole,L M ; Financial Institutions and Markets; McGraw-Hill Education
2. Pathak, Bharti V.; Indian Financial System; Pearson Education
3. Khan, M.Y.; Indian Financial System; McGraw-Hill Education
4. Varshney ,P.N ; Banking law and practice ; Sultan Chand and Sons

Reference Books

1. Singh, S.P.; Indian Financial System; Wisdom Publication
2. Machiraju, H.R.; Indian Financial System; Vikas Publishing House
3. Desai, Vasant; Fundamental of Indian Financial System; Himalaya Publishing House
4. Varshney, P.N. and Mittal, D.K.; Indian Financial System; S. Chand and Co.

Course Outcomes

- The student will able to know about the functioning and working of various financial institutions in India thus in turn connecting it to the working of Indian economy.
- Student will be able to gain knowledge about the working of various financial instruments in the primary and secondary market in India as well as foreign market.
- Student will be able to gain knowledge about the banking industry and working of its various products.

Working Capital Management

Code: RMB FM 04
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To have a basic understanding of the concept and importance of sound working capital strategies of a firm.
- ☐ To have an understanding of the impact of working capital policies relating to Cash management, inventory and receivables management on firm's profitability.
- ☐ To gain an insight into the sources of working capital financing.

Unit- I : Introduction to Working Capital **(10 Hrs)**

Nature, Scope and Definition of Working Capital, Types of working Capital, Determinants of working capital , Working Capital Cycle, Assessment and Computation of Working Capital Requirement, Profitability–Liquidity trade-off, Working Capital Policy - Aggressive & Defensive. Overview of Working Capital Management

Unit - II : Management of Cash and Marketable Securities **(8 Hrs)**

Meaning of Cash, Motives for holding cash, objectives of cash management, factors determining cash needs, Cash Management Models, Cash Budget, Cash Management: basic strategies, techniques and processes, Lock Box system and concentration banking, compensating balances ; Marketable Securities: Concept, types, reasons for holding marketable securities, alternative strategies, choice of securities; Cash Management Practices in India.

Unit - - III: Management of Receivables **(7 Hrs)**

Receivables: Nature & cost of maintaining receivables, objectives of receivables management, factors affecting size of receivables, policies for managing accounts receivables, determination of potential credit policy including credit analysis, credit standards, credit period, credit terms, etc; Collection Policies; Credit Management in India.

Unit - IV: Inventory Management **(7 Hrs)**

Inventory: Need for monitoring & control of inventories, objectives of inventory management, Benefits of holding inventory, risks and costs associated with inventories, Inventory Management: Minimizing cost in inventory, Techniques of Inventory Management - Classification, order quantity, order point , ABC Analysis etc

Unit - V: Working Capital Financing **(8 Hrs)**

Need and objectives of financing of working capital, short term credit, mechanism and cost-benefit analysis of alternative strategies for financing working capital : accrued wages and taxes, accounts payable, trade credit, bank loans, overdrafts, bill discounting, commercial papers, certificates of deposit, factoring, secured term loans, etc; Pattern and sources of Working Capital Financing in India with reference to Government policies, working capital control and banking policy- Deheja study group, chore committee , Tandon Committee.

SUGGESTED READINGS :

- **Bhalla V.K - Working Capital management, Text and cases, Anmol Publication, Delhi , 11th edition**
- **Rangrajan - Working Capital management, Excel Books**
- Bhattacharya – Working Capital management , 2e, PHI
- Periasamy - Working Capital Management –Theory & Practice, Himalaya
- Rustagi - Working capital Management, Taxmann
- Sharma - Working Capital Management ,Himalaya publication

Skills	Measuring tool
Ability to prepare cash budget	Exercise + Workshop
Ability to Appraise various receivable policies	Exercise + Workshop
Ability to apply and understand inventory management techniques	Exercise + Workshop

Course outcome:

- Evaluate comparative working capital management policies and their impact on the firm's profitability, liquidity, risk and operating flexibility.
- Evaluate the importance of effective working capital management and its role in meeting the firm's strategic objectives and its impact in value creation.
- Investigate funds flow cycles and their impact on working capital management objectives.
- Compare and contrast the relative merits of alternative working capital policies and the likely short-term and long-term impact on the firm.
- Formulate appropriate working capital management policies to achieve corporate objectives.
- Apply corporate cash management, accounts receivable management, bank relations, and inventory management techniques to maximize the share holders' value.
- Write a plan for a balanced integration of cash, credit and other short-term topics and policies.
- Formulate and integrate an extended treatment on international working capital topics.

Financial Derivatives

Code: RMB FM 05
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective:

- To make students aware of different types of Derivatives
- To develop an understanding amongst students of financial derivatives and associated regulatory framework
- To have an understanding of the derivative tools such as options, futures and their application to hedging.

Unit – 1

Introduction to derivatives market; Definition, Evolution and features of Derivatives, Types of Derivatives, Forward , futures and options market, Forward market transactions , Forward contracts , Forward market in India , Hedging with forwards.

Unit – 2

Forwards and Futures: Forward Contract, features of forward contracts Futures contract , types , functions , distinction between futures and forward , pricing of futures contract, Currency Futures , Hedging in Currency Futures , Speculation and Arbitrage in Currency Futures , Pricing of Futures, Cost of Carry Model , Application of Market Index , Index Futures in the Stock Market , Indian Derivatives Market.

Unit – 3

Introduction to Options , Hedging with Currency Options , Speculation and Arbitrage with Options ,Pricing Options , General Principles of Pricing , Black Scholes option pricing Model Index Options , Hedging with Index Options, Speculation and Arbitrage with Index Options, Index Options Market in Indian Stock Market , Use of different option strategies to mitigate the risk

Unit – 4

Financial Swaps, Managing Interest Rate Exposure, Interest Rate Swaps, Currency Swaps Interest Rate Futures, Forward Rate Agreement

Employable skills :

Skill	**Measurement tool**
Derivatives & Develop a understanding of financial derivatives and associated regulatory Framework. understanding of the derivative tools such as options, futures and their application to hedging.	Case study
	Analysis
	Quiz
	Workshops

References :

1. Thomas Susan, Derivatives Market in India; Tata McGraw Hill
2. Financial Derivatives : Theory, Concepts and practices by S.L. Gupta, PHI, 2005.
3. Financial Derivatives by S.S.S Kumar, PHI , 2007
4. Options, Futures and other Derivatives, John C. Hull; Prentice Hall of India; New Delhi, 1997.

Websites:
1. www.bseindia.com
2. www.nseindia.com
3. www.sebi.com
4. www.careratings.com
5. www.crisil.com
6. www.icraindia.com
7. www.capitalmarket.com

Course Outcome:

Upon successful completion of this course, the student will:
- ☐ Understand how derivative securities work and how they are traded.
- ☐ Understand the principles of derivatives pricing, including the implications of arbitrage.
- ☐ Be able to price forward and futures contracts using the cost of carry model.
- ☐ Be able to value options using the binomial and Black-Scholes option pricing models.
- ☐ Be prepared to use futures and options in financial risk management, speculation and arbitrage.
- ☐ Learn important lessons from derivatives disasters.

Specialization Group: International Business

International Marketing

Code: RMB IB 01

Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES : The objectives of this course are to

- Provide understanding of the decision variables a marketing manager may use in an international marketing environment.
- To gain experience in developing international marketing strategies.
- Provide understanding of product and pricing decisions appropriate for international market.
- Develop the basic skills needed to develop an international marketing communications plan and strategy,
- Provide opportunities for practical implementation of the relevant concepts through analysing a variety of international business scenarios.

UNIT 1 **(6 Hours)**

Introduction, Importance and Challenges – Nature, Importance and scope of International Marketing, Domestic marketing vs. International marketing, International marketing management process , EPRG framework an overview: influence of physical, economic, socio-cultural, political and legal environments on International marketing information, scanning and monitoring global marketing environment;

UNIT 2 **(8 Hours)**

International Marketing Research Introduction, Concept of Marketing Research, Need for Marketing Research, Approach to Marketing Research, Scope of International Marketing Research, International Marketing Research Process, market surveys, marketing information systemInternational market segmentation, International positioning strategies, International marketing strategies International Market Entry Strategies Introduction, Different Entry Modes and Market Entry Strategies, joint Ventures, Strategic Alliances, Direct Investment, Manufacturing and Franchising.

UNIT 3 **(8 Hours)**

International Product Policy and Planning Introduction, Product Planning in International Markets,Packaging and Labelling, International Product Life Cycle, Branding decisions in international markets: standardization vs Adaptation , Protecting brand names

Unit 4 **(8 Hours)**

International Pricing Policy: Introduction, Price and Non-Price Factors, Methods of Pricing, International Pricing Strategies, Dumping and Price Distortion, Counter Trade Legal and Ethical

Issues in International Marketing Introduction, Nature of International Business Disputes and Proposed Action, Legal Concepts Relating to International Business

Unit 5 **(6 Hours)**

International Promotional Strategies Introduction, Communications Process, principles of communication, Status of Promotion, Promotion Appeals, Media Selection, Personal Selling, Public Relations and Publicity, Sales Promotion, advertising, e-marketing International e-tailing, concept and types, benefits, segmentation, pricing and promotional strategies in etailing.

LEARNING OUTCOMES: Upon completion of this course, students will be able to complete the following key tasks

- ☐ Identify and analyse opportunities within international marketing environments
- ☐ Undertake strategic business analysis in order to develop appropriate international marketing objectives and strategies
- ☐ Identify, analyse, and evaluate information, and evidence related to international business opportunities and threats relevant in the current world.
- ☐ Develop proper product and pricing decisions in a particular target market
- ☐ Understand process of international marketing communication strategies and adapting to specific market needs.

TEXT BOOK

1. Nargundkar- InternationalMarketing (Excel Books)
2. Czinkota - International Marketing (Thompson, 8th Ed.)
3. Kotabe helson- International Marketing(Wiley, 6th Ed.)
4. Cateora Graham - International Marketing (TMH, 10th Ed.)
5. Siddiqui- InternationalMarketing (Wiley Dreamtech)
6. Cherunilam F - International Trade and Export Management (Himalaya, 2007)

REFRENCE BOOK

7. Varshney R.L, Bhattacharya B - International Marketing Management (Sultan Chand & Sons, 9th Ed.)
1. Jain S. – International Marketing (Thomson)

Skills	**Measuring tool**
Prepare an international marketing plan	
Analyzing the social, political, legal, and economic forces that affect the business performance of international marketing	Workshop+ case study
Develop a global marketing communication plan to promote the Brand	

INTERNATIONAL LOGISTICS

Code: RMB IB 02
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES : The objectives of this course are to develop

- ☐ To gain a working understanding of logistics principles
- ☐ To introduce key activities performed by the logistics functions.
- ☐ To understand the aspects of shipping industry and freight system
- ☐ To understand the ports facilities and global air transportation.
- ☐ To understand the role and importance of information and communication technology in logistics management.

UNIT 1 **(6 Hours)**
Introduction to Logistic System: Concepts of Logistics, Scope and Objectives of Logistics, System Elements, Importance of Logistics, International Logistics development, International trade logistics Chain, Shippers logistics requirement in trade

UNIT 2 **(8 Hours)**
Structure of Shipping Industry , Different type of Ships, Shipping Routes, Operating Ships-Linear and Tramp, Organization of a Shipping Company, Shipping Formalities, Conference System, Chartering-Types, principles and practices; Charter party agreement, Transportation: Transport Fundamentals: Importance of effective transportation system; Service choices and their characteristics; inter-modal services; Transport cost characteristics and rate fixation; In-company management vs. out –sourcing.

UNIT 3 **(8 Hours)**
Warehouse management , Inventory management Ocean freight rates: freight or tariff rates, freight surcharge, freight rebates. Principles of Freight Rates, Linear Freight Structure, Tramp Freight Structure, Shipping intermediaries: customs broker, freight forwarders, shipping agents, stevedores.

Unit 4 **(8 Hours)**

Ports in India, Ports Infrastructure Development, Shipping Association, Shipment of Govt. Controlled Cargo. Concept of Containerization, benefits of Containerization, I.C.D/CFS. International Air transport: Concept of Air Transport, Advantages of Air Transport, Constraints, Air Cargo, Tariff Structure, I.A.T.A.

Unit 5 **(6 Hours)**

Information and communication technology in logistics management, Reverse Logistics: Application area and activities involved. Internationalization of SCM. Integrated SCM: Concept, span and process of integrated SCM, Supply Chain performance measurement

COURSE OUTCOMES:

- To view logistics as more than an operational function that passively executes a plan, but as a strategic function that creates value and competitive advantage
- Develop in the right way the process of organizing and conducting the proceedings relating to the transport and shipping .
- Able to carry basic assesssment of freight and ports work enviornemnt.
- the use and impact of e-commerce in logistics

TEXT BOOK

- Dr. Sudalaimuthu and S. Anthony Raj, Logistics for International Business: Text and cases, Prentice Hall India, New Delhi.
- Bowersox, Donal J. and David Closs, Logistical Management, 5th ed., McGraw-Hill
- Johnson J, Wood D- Contemporary Logistics.

REFRENCE BOOK

- Reji Ismail- Logistic Management (ExcelBooks)
- Dornier- Global Operation & Logistic Management (John Wiley)
- Khanna K K - Physical Distribution Management : Logistical Approach (Himalaya, 2007)

Skills	**Measuring tool**
Understands international logistics Systems	Case study + Workshop
Basic assessment of freight	Exercise + Workshop

Export Import Documentation

Code: RMB IB 03
Course Credits: 3 **Teaching Hours: 36 Hrs**

Corse Objectives:

- ☐ The basic objective of this course is to provide to the country a steady stream of competent young men & women with the necessary knowledge, skills and foundations for acquiring a wide range of rewarding careers into the rapidly expanding world of Import & Export Management
- ☐ To promote basic understanding on the concepts of export and import documentations to enable them to realize the impact of documentations.

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Unit 1 - (8 Hours)

Introduction to exports, Registration process, Selection of products and market Payment terms, Export costing and pricing , Preliminaries for exports. Registration – IEC, RCMC, EPC, Central Excise. (*BCMC changed to RCMC)* Categories of Export, Physical – Direct & Indirect, Deemed Exports Merchant & Manufacturer Exports

Unit 2 (8 Hours)

Shipment procedures, Role of clearing and forwarding agent, Cargo management Containerization, Shipping documents and terms used in shipping, Export Procedures Excise clearance for exports, Marine insurance of Export cargo Shipment goods, Quality and Pre Shipment inspection, EGC Services, GSP rules of origin

Unit 3 (8 Hours)

Meaning and importance of letter of credit, Documentation papers of L/C

EXPORT incentives, risk and insurance, Benefits of Exports, xcise clearance Benefit / Rebate, Income Tax Benefit , *(IPRS is discountiued),* Shipment & Transport – Sea, Air, Rail, Road, Pipeline, Role of overseas agent & remittance of commission.

Unit 4 – (12 Hours)

The organization of exports –imports firms and business planning, Planning of export/import operations. Import procedures Overview of various export promotion schemes Duty Drawback-Advance License, (*Replenishment Licenses, Special Interest License is discontinued),* Remission Scheme, DEPB Scheme

Unit 5 (4 Hours)

Export Promotion Capital Goods Scheme. Diamond & Jewelry, Agricultural & Pharmaceutical product exports promotion, scheme. Export of Principal Commodities in India, SEZ, EHTP,STP & EOU’s, Types of Export Houses.

(Free trade zones have been changed to SEZ)

Employable Skills:

Skill	Measurement tool
Entrepreneurial skill	Workshop on business planning
Managerial competitive Skill	Assignment on **SWOT** analysis
Business acumen	Case studies

Course Outcome : Upon successful completion of this course , the student will be able to:

1. Demonstrate an understanding of the forces that shape the export and import
2. Explain why business ethics is an integral part of every export and import.
3. Understand the business and related factors; and business's dependency on the interactions with different capital goods .

Journals / Magazines, business world , business today

Books Recommended:

1. New Import Export Policy - Nabhi Publications
2. 2. EXIM Policy & Handbook of EXIM Procedure – VOL I & II
3. 3. A Guide on Export Policy Procedure & Documentation– Mahajan
4. 4. How to Export – Nabhi Publications
5. 5. Export Management – D.C. Kapoor

Trading Blocks & Foreign Trade Frame work

Code: RMB IB 04
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- To provide specialize knowledge in international trade
- The main objective of this course is to familiarize the students with the international trade environment and the special decision variables underlying the discharge of different blocks function in a multinational corporation

Unit 1
India's foreign Trade policy: origin, meaning and importance, determinants of Indian FOREIGN TRADE POLICY (SALIENT FEATURES OF EXIM POLICY), Regional economic integration.

Unit 2
Flow of foreign trade and trade relations, India balance payment, Theory of balance of payment, balance of trade, Performance of India's external sector and recent trade reforms , sectoral analysis of India's foreign trade and India's trade basket, trade liberalization in transition economies, India's trade agreement with SAARC , European Unions (EU), US, ASEAN and China, BRICS, OPEC. India's with common wealth countries.

Unit 3
Institutionalization of international trade, Pre GATT scenario, Establishment of WTO, summit of WTO,Regional blocks NAFTA, SAFTA ASEAN etc. Concepts, Objectives ,TRIPs ,Law and procedure ,Trade marks ,Copy rights

Unit 4
Settlement of disputes under WTO, India's Trade relationship with major Trade Blocs in the world India's Trade agreements with various blocks.

Unit –5
Foreign investment policy – policy framework for FDI in India. FDI trend of FII and FDI in India.

Skill	**Measurement tool**
Entrepreneurial skill	Workshop on business planning
Managerial competitive skill	Assignment on Trade analysis
Business acumen	Case studies

Compulsory Reading: < intellectual property david Bainbridge pearson publication

Course Outcome : Upon successful completion of this course , the student will be able to:

4. Demonstrate an understanding of the forces that shape the international trades and blocks
5. Explain why business ethics is an integral part of every international trade.
6. Understand the business and related factors; and business's dependency on the interactions with different international groups .

Reference Books:

Journals / Magazines

1. Francis Cherrunilam, International Trade and Export Management, Himalya Publications, 2009.
2. Bhagvati J (ed), International Trade , Penguin Books , 2007.
3. India's Trade statistics, published by CMIE and DGCIS.
4. RBI Annual Reports,
5. Annual Reports of Ministry of Commerce

CROSS-CULTURAL MANAGEMENT

Code: RMB IB 05
Course Credits: 3 **Teaching Hours: 36 Hrs**

OBJECTIVES

- ☐ To consider the nature of intercultural communication
- ☐ To learn to think across cultural differences
- ☐ To experiment with different ways of acting in cross-cultural situations
- ☐ To reflect on the cultural foundations of economic systems and of organizational practices

Unit I: Introduction
Understanding culture: Values, world views and socio-cultural systems What is culture and why is it important? How do people react to cultural differences?

Can we measure or graph cultural differences? Is it possible to change a culture? If so, how? What does culture have to do with business? Ways of describing cultural differences Going International, (**Assignment)**:Come to class with an idea for discussion

Unit II: Cultural diversity and multicultural teams:
The impact of cultural differences on individuals, Verbal and non-verbal communication across cultures, Kohlberg's theory of moral reasoning, Measuring cultural development, The historical origins of beliefs and values, Impact of cross cultural communication, **,** Kohlberg, Malcolm X, and Martin Luther King Jr, Are some societies better than others?, Relativism vs. development, Respect cultural differences vs. stages of development, The possibility of an international subculture

Unit III: Conflict and negotiation:
Gender differences**,** Gender, multiethnicity, religion, geography Body language, The culture of poverty, Hofstede's dimensions, Cultural aspects of international business negotiations, Negotiation process, Negotiation Strategies

Unit IV: Cultural diversity and multicultural teams
National cultures vs. organizational cultures, Knowledge cultures, Cross-cultural intelligence and managerial competence, Motivating across cultures, Management of cross-culture teams, Leadership traits required for managing cross culture teams Participatory Strategic Planning and the Technology of Participation Change in corporate culture: the example of quality improvement

Unit V Culture and ethics
Understanding significance of cultural values & ethics in cross boarder businesses, Corporate Culture and Cros Border HRM and Employment Practices with respect to Japan, European countries, US, China, corporate social responsibility in MNC's , The McDonald's Corporation,

COURSE OUTCOME

- ☐ Present an overview and analyze different meanings and dimensions of “culture”;
- ☐ Describe and analyze the impact of culture on business practices;
- ☐ Explain and analyze the impact of national culture on organizational cultures;
- ☐ Understand the impact of culture on Human Resource Management;
- ☐ Explain how leadership differs across cultures;

TEXT BOOKS

1. Cross culture management by Ms Shobhana Madhavan, Oxford University Press, 2011
2. Eastern and Cross Culture Management by N K Singh , Springer

RECOMMENDED TEXT

Gannon, Martin J. *Paradoxes of Culture and Globalization*. Sage Publications, 2008.

Class notes are available at www.gwu.edu/~umpleby/mgt216

For information on group projects see www.gwu.edu/~rpsol/service-learning

Specialization Group: Information Technology

Enterprise Resource Planning

Code: RMB IT 01
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective:

- ☐ To impart knowledge about enterprise resource planning, related technologies and its implementation.
- ☐ Critically reflect upon theoretical approaches and analyse their application to achieve use of enterprise systems to support operations and management practice.

Unit I: **(4 Hours)**
Introduction Concept of ERP, Advantages of ERP, Growth of ERP.

Unit II **(10 Hours)**
ERP and Related Technologies Business process reengineering (BPR), Management information system (MIS); Decision support systems (DSS), Executive support systems (ESS), Data warehousing, Data mining; Online analytical processing (OLAP)- This is OLAP and not OLTP, Supply chain management (SCM), Customer relationship management (CRM), Enterprise Content Management (ECM), Business Process Management (BPM).

Unit III **(8 Hours)**
ERP Modules Finance, Production planning, Control and maintenance, Sales and distribution, Human resource management (HRM), Inventory control system, Quality management; ERP Solutions in the markets, sector specific ERP solutions, Business Intelligence.

Unit IV **(9 Hours)**
ERP Implementation Life Cycles Evaluation and selection of ERP package, Project planning, Implementation team training and testing, End user training and going live, Post evaluation and maintenance, Issues and challenges in ERP implementation, Business models with vendors, Cloud based ERP offering.

Unit IV ERP Case Studies **(5 Hours)**
Post implementation review of ERP Packages in manufacturing, services, and other organizations.

Text Books

1. Leon, Alexis; ERP Demystified; McGraw-Hill Education.
2. Joseph, A. Brady, Ellen, F. Monk and Wangner, Bret J.; Concepts in Enterprise Resource Planning; Thomson Learning.

Reference Books

1. Garg, V.K. and Venkitakrishnan, N.K.; Enterprise Resource Planning: Concepts and Planning; PHI Learning

Course Outcomes:

- The student should be able to have a clear and relevant understanding of the definitions, importance, potential business values and relevant technologies of ERP Systems.
- The students should be able to analyze important issues in implementing an ERP system in an organization.

Web Technology and E- commerce

Code: RMB IT 02
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective

- ☐ To impart knowledge about basic concepts, significance, categories and implementation of e-business.
- ☐ The course prepares students, as future managers, to critically assess the impact of information systems on the E-Business. It also introduces those skills required in order to manage online environments and projects

UNIT I **(8 Hours)**
Introduction to Google analytics Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Adding website profiles,demographics, Visitors ,Traffic sources, content ,Setting goals and custom ,porting , Sitemap, diagnostics for errors.

UNIT II **(7Hours)**
Web Commerce Models :Definition, scope and significance of web Commerce, Business Models - Business to consumer (B2C), Business to business (B2B), Consumer to consumer (C2C), Peer to peer business model, m – Commerce business model, E – Governance (G2C, G2B, G2G).

UNIT III **(8 Hours)**
e – Marketing and Trade : Understanding internet audience and online consumer behavior, Internet marketing technologies, e – retailing, Online market research, Online marketing communications, Data warehouse and data mining, e - Customer relationship management, Online advertising, Online branding strategies, Online pricing strategies, Website as a marketing communication tool.

Unit IV **(5 Hours)**
Online Payment System and Security Working of Electronic payment systems, Online banking, Advantages and limitations, Mobile commerce, Mobile banking, concept of Digital cash and plastic money, Debit and Credit cards, Security threats in online environment, Elements of good E-commerce security, Protecting internet Communication, E-commerce security plan.

Unit V **(8 Hours)**
Web Page Designing: Introduction to HTML ,Web Publishing :-Contents – Blocks, Text, Form Elements,Links – To a page, Within Page, To a Site, Links And Images – Image Mapping- Server Side, Client Side, Layout – List (OL, UL, DL) - Tables- Frames (Nested, I Frame) Head Elements – Base Font, Meta Tags, Scripts, Introduction to Joomla (open Source)

Text Book

1.Laudon, Kenneth C, and Traver Carol G; E-Commerce – Business. Technology Society, Pearson Education.

2. The Complete Reference to HTML - Thomas Powell 3.AvinashKaushik ,Web analytics ; wiley publication

Reference Books

1. Turban, Efraim, Lee Jae, King David and Chung Michael; “Electronic Commerce – A Managerial Perspective”, AddisonWesley

2. Kalakota R; “Electronic Commerce – Frontiers of E – Commerce”, Pearson

3. Education

4. HTML - Beginner’s Guide - Willart
5. Microsoft Office 2003 Front page Inside Outside

Course outcomes

- ☐ Student will develop an understanding of and sensitivity to, the range o professional issues involved in managing the adoption and development o IS projects in the E-Business environment. The subject matter will exclud highly technical definitions of systems and analysis techniques. The subjec material will cover generalizable lessons concerning the adoption an development of E commerce

Cloud Computing For Business

Code: RMB IT 03
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective

- To impart knowledge about cloud computing and its application in business.
- To familiarize students with the concept of application security and the concept of virtualization in cloud computing.
- To help student weight the impact of improperly controlled cloud computing environments on organizational sustainability

Unit I **(5 Hours)**
Introduction Evolution of cloud computing, Models for cloud computing (IaAS, PaAS, SaAS etc.), Cloud computing vendors, Cloud computing threats, Cloud reference model, Security for cloud computing, Introduction to cloud computing market (vendors and solutions).

UnitII **(6 Hours)**
Governance and Enterprise Risk Management Information security governance processes, Enterprise risk management in cloud computing, Enterprise risk management recommendations, Information risk management.

Unit III **(7 Hours)**
Information Lifecycle Management and Data Centre Operations Key challenges regarding data lifecycle security, Data centre operations, Implement five principal characteristics of cloud computing, Data centre security recommendations.

Unit IV (**10 Hours)**

Application Security Web Application, Attack methods, what is web application security, Application security layer, Vulnerability distribution, Security solutions, Applications in cloud environments security. Virtualization: Hardware virtualization, Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization, Virtualization security and recommendations.

Unit V Cloud Computing for Business 8
Comparison of traditional Vs Cloud based business solutions, Designing cloud based business solutions, Business models for engaging cloud vendors, Issues and challenges in cloud based business models.

Text Books

1. Mulholland, Andy, Pyke, Jon, and Finger, Peter; Enterprise Cloud Computing: a strategy guide for business and technology leaders; Meghan Kiffer Press
2. Linthicum, David S.; Cloud Computing and SOA Convergence in your Enterprise: A Step-by-Step Guide; Addison Wesley Information Technology Series

Reference Books

1. Rhoton, John; Cloud Computing Explained: Implementation Handbook for Enterprises; Kindle Edition
2. Reese, George; Cloud Application Architectures: Building Applications and

3. Infrastructure in the Cloud; O'reilly publication

Course outcomes

- ☐ The student will be able to assess various cloud characteristics and service attributes, for compliance with enterprise objectives
- ☐ The student will be able to recognize security threat exposure within a cloud computing infrastructure
- ☐ Student will be able identify various cloud services.

DATABASE MANAGEMENT SYSTEM

Code: RMB IT 04
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective:

- ☐ The course has been designed to introduce the students with the applications of systems designed to manage the data resources of organizations.
- ☐ The course gives an insight to students about the concept of data mining and warehousing.
- ☐ The course familiarizes the student with requirement and working of database administrator.

Course Outcomes

- ☐ The student will be able explain about the various types of database Models
- ☐ The student gains knowledge about the working of relational model with the help of various SQL queries
- ☐ The conceptual knowledge of remote data access, data warehousing and mining helps the student understand more about working pattern of Industries.

Unit I **(8 Hours)**
Introduction to Database : Organization of Database; Components of Database Management Systems; Data Models; Entity-Relationship Model; Network Data Model; Hierarchy Data Model; Relational Data Model; Semantic Data Model; Advantages of DBMS.

Unit II **(6 Hours)**
Relational Database Design Integrity Constraints; Functional Dependencies; Normalisation; PhysicalDatabase Design; Decomposition of Relation Schemes;

Unit III **(10 Hours)**
Structured Query Language
Oracle- Creating Tables; Applying column constraints; Inserting Rows; Views Snapshots, Indexes & Sequences.Cursor, Triggers, Procedures, Functions & Package.

Unit IV **(6 Hours)**
Introduction to data mining & Data Warehousing; Knowledge Extraction through Data Mining.

Unit V **(6 Hours)**
Database Utilities; Security, Object/Basic Database Administration/ Remote Data Access.

SUGGESTED READINGS:
Text Books

1. Navathe E - Fundamentals of Database Systems (Pearson Education, 3rd Ed.)
2. Majumdar and Bhattacharya - Database Management System (Tata McGraw Hill, 1996)

Reference Books

1. Chakrabarti- Advance Database Management System (Wiley Dreamtech)
2. Beynon -Davies P- Database Systems (Palgrave, 2003)
3. KarthikeyanUnderstanding Database Management System (Acme Learning)
4. Hoffer - Modern Database Management (Pearson Education, 6th edition)

SYSTEM ANALYSIS & DESIGN

Code: RMB IT 05
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objective

- This course aims at acquainting these students with tools techniques of planning, analyzing, designing, implementing and maintaining Information system.
- The student able to gain insight into the various types of threat which an information system is exposed.

UNIT-I **(8 Hours)**
Systems Concept; Characteristics of a System; Elements of System; Types of Systems; Decision SupportSystem; System Development Life Cycle, Investigation, Analysis, Design, Implementation, PostImplementation Review and Maintenance.

UNIT-II **(6 Hours)**
Systems Planning and Investigation: Basis for Planning in Systems Analysis - Dimensions of Planning, InitialInvestigation, Needs Identification,

UNIT-III **(6 Hours)**
Determining the User's Information Requirements, Feasibility Study, Feasibility Considerations inFeasibility Analysis - Feasibility Report.

UNIT-IV **(8 Hours)**
Tools of Structured Analysis : Data Flow Diagram (DFD), Entity Relationship Diagrams, Data Dictionary,Process Modeling : Structured English, Decision Tree & Decision Table, Object Oriented Analysis (OOA) andObject Oriented Design (OOD).

UNIT-V **(8 Hours)**
Basics of Information Security, Types of Attacks, Viruses, Virus Control, Hackers, Overview of Risks associated with Internet, Intrusion Detection Risk Management**,** Disaster Recovery Plan, Cryptography and authentication, Managing Risk, Information Security Policy, Creating a secure environment, Internet Security Standards

Suggested Readings: Text Book

1. Kenneth E Kendall and Julie E Kendall – SAD (PHI Publication, 7 Ed.)

Reference Books

1. Shah-Software Engineering &SAD(Wiley Dreamtech)
3. Grienstein and Feinman- E-commerce –Security, Risk Management and Control (TMH, 2nd Ed.)
4. AnkitFadia -Encryption-Protecting your Data (Vikas Publication, 1st Ed.)
5. Singh B –Network Security (PHI Publication, 1st Ed.)

Course Outcomes

- The student will be able to know the various phases of making of information systems and to take various steps to protect the system from threats which can cause serious damage.

Specialization Group: Operations Management

SUPPLY CHAIN MANAGEMENT

Code: RMB OP 01
Course Credits: 3 **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES

The objectives of this course are to provide the student with:

- ☐ An understanding of the componenets and processes of supply chain management and the main performance drivers of supply chain.
- ☐ An understanding of the inventory management methodologies and modes of transportation .
- ☐ An understanding of concept of procurement and outsourcing decision.
- ☐ To provide basic understanding of warehousing and perfromance management tools.
- ☐ An understanding of information systems to support collaboration and concept of global supply chain

UNIT 1 **(6 Hours)**

Understanding of Supply Chain: Objectives of a supply chains, decision phases, stages of supply chain, supply chain process , cycle view of supply chain process, key issues in SCM, logistics & SCM , Supply chain drivers and obstacles/drivers of supply chain- inventory, transportation, facilities and information, supply chain strategies, strategic fit, Best practices in SCM,**.**

UNIT 2 **(8 Hours)**

Inventory Management: Functions of inventory, inventory costs, ABC analysis, Material Requirement Planning, JIT , Kanban , Vendor Managed Inventory Transportation: Role , key role players, factors that influence transport decisions, transportation modes, containerization, cross docking

UNIT 3 **(8 Hours)**

Procurement : nature and concept, procurement and value chain, strategic procurement model, Bullwhip effect and reduction Outsourcing: nature and concept , strategic decision to outsourcing, third party logistics(3PL), fourth party logistics(4PL)

Unit 4 **(8 Hours)**

Warehousing: concept and types, warehousing strategy, warehouse design Performance measurement: dimension, tools of performance measurement, SCOR Model.Demand chain management, green supply chain management, reverse logistics

Unit 5 **(6 Hours)**

Supply Chain and CRM- Linkage, IT infrastructure used for Supply Chain and CRM, Functional components for CRM solution.

Global Supply chain – challenges in establishing global supply chain, Factors that influences designing global chain network.

COURSE OUTCOMES: Upon completion of this course, students will be able to complete the following key tasks

- ☐ Apply the basic framework of Supply Chain Management and basic concepts in logistics, distribution, warehousing
- ☐ Understand the roles of supply chain among various business functions and their roles in the organizations' strategic planning and gaining competitive advantage.
- ☐ Analyze inventory management methodologies and evaluate and select transportation modes.
- ☐ Interpret the procurement and outsourcing decisions and prepare the supplier selection
- ☐ Assess the strategic role and impact of IT technologies on supply chain integration

Text Books

1. Chopra, Sunil, Meindl, Peter and Kalra, D. V.; Supply Chain Management: Strategy, Planning and Operation; Pearson Education
2. Altekar, Rahul V.; Supply Chain Management: Concepts and Cases; PHI Learning Reference Books
3. Ballou, Ronald H.; Supply Chain Management; Pearson Education
4. Sahay, B.S.; Supply Chain Management; Macmillan
5. Ballou, R.H. Business Logistics Management. Prentice-Hall Inc.
6. Bowersox D.J. , Closs D.J. , Logistical Management, McGraw-Hill, 1996

1. Skills	**Measuring tool**
2. Designing of supply chain to gain	Case study + Workshop
3. competitive advantage	
4. Able to employ inventory model and	
5. Techniques	
6. Evaluate and select transportation	
7. Modes	

Materials Management

Code: RMB OP 02
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

1. To help students to know about functionality of materials management in business
2. To help students to understand the different tools used to storing material efficiently
3. To help students to understand the complete process of Purchasing.
4. To help students to understand the different techniques of reducing inventory cost.
5. To help students to understand the process buying material internationally.

Unit 1: Introduction to materials management

Need of Material Management, Meaning and concept of integrated Materials management, interdepartmental relationships , organizational structure of materials management department, Understanding of Materials research, General corporate policy of materials management

Unit 2: Stores Management:
Purpose , location and layout of stores Store system and procedures (receipt , storing , issuing of Material) ,Codification and standardization: nature and process of codification, advantage of codification , need and benefit of standardization , KODAC and BRISCH systems, Surplus , obsolete and scrap management ,disposal of scrap, material handling systems, store accounting and stock verification ,Case studies

Unit 3: Purchasing Management:
Purchasing functions and purchasing systems, 8 R's of purchase ,types of purchases , purchase budget, price forecasting techniques, buying seasonal commodities purchasing under uncertainties, purchasing of Capital equipments , purchase policy of High Consumption Value items like raw materials , public buying (DGS&D) , Buying through Tenders, Insurance in Buying, Legal Aspects of purchase.

Unit4 :Inventory models:
Meaning of inventory, Types of inventory ,Static- risk model of inventory , dynamic-certain EOQ model , ABC Analysis, Cost sensitivity analysis, Q System and P
System of Inventory management, The system of calculating maximum minimum order quantity and safety stocks.

Unit 5 :International perspective of materials management:
Material requirement planning, Hybrid ,MRP, GIT Materials planning, Outsourcing and off shoring , import substitutions , sourcing material internationally (imports) , procedure for importing the material and its documentation , ERP in materials management

References:
Materials Management : An Integrated Approach , P Gopalakrishnan, PHI
Production and operations management, Bedi, Oxford University Press

PRODUCTION PLANNING & CONTROL

Code: RMB OP 03
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To understand the various fundamentals and functions of production planning and control.
- ☐ To impart learning on work study procedures and practices.
- ☐ To generate understanding on the essentials of product/ process planning and useful tools to accomplish both.
- ☐ To develop knowledge and ability to undertake production scheduling procedures.
- ☐ To know the recent trends in production planning and control such as manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP) and global practices.

UNIT 1 (**8 hours)**
Introduction: Meaning and objective of Production Planning & Control, functions, roles & responsibilities of PPC manager. Forecasting – different techniques of production forecast.

UNIT 2 (**7 hours)**
Process of Production Planning and Control – Routing, scheduling and controlling. PPC: Job, batch, Mass (assembly) and continuous, and Master Production Schedule.

UNIT 3 (**7 hours)**
Aggregate Planning – Meaning, Strategies and Cost, concept of aggregate planning; capital-intensive, labour-intensive, and fashion industries.

UNIT 4 (**7 hours)**
Waste management, value and waste, types of waste; 5S techniques of eliminating wastes.

UNIT 5 (**7 hours)**
Control Systems: Product control systems, Gantt Charts, Bar Charts.

Text Books

1. MartandTelsang, "Industrial Engineering and Production Management", S. Chand and Company, First edition, 2000.
2. James.B.Dilworth, "Operations Management – Design, Planning and Control for manufacturing and services" Mcgraw Hill International edition 1992.

Reference Books

1. S.N.Chary, “Theory and Problems in Production & Operations Management”, Tata McGraw Hill, 1995.
2. KanishkaBedi, “Production and Operations management”, Oxford university press, 2nd Edition 2007.
3. Elwood S.Buffa, and RakeshK.Sarin, “Modern Production / Operations Management”, 8th Ed. John Wiley and Sons, 2000..
4. Melynk, Denzler, “Operations management – A value driven approach” Irwin Mcgrawhill.
5. Norman Gaither, G. Frazier, “Operations Management” Thomson learning 9th edition IE, 2007
6. K.C.Jain& L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers, 1990.

Course Outcomes:

- ☐ It will help in understanding the fundamentals of production planning and profit considerations.
- ☐ It will provide quantitative knowledge and capability to use various product/process planning tools.
- ☐ It will enable them to devise appropriate strategies concerning aggregate panning and cost.
- ☐ It help in resolving complex scheduling issues by way of implementing standard scheduling procedures.
- ☐ It will enhance exposure to recent trends in production planning and control and increase adaptability with latest global-production practices.

Sn	**Skills**	**Measuring Tools**
1	Product/Process Plan development	Workshop, Discussion, & Exercise
2	Costing and aggregate planning	Exercises
3	Production Scheduling tool applications	Exercises

World Class Manufacturing & Maintenance Management

Code: RMB OP 04
Course Credits: 3 **Teaching Hours: 36 Hrs**

Course Objectives:

- ☐ To help students understand the global competitive environment being faced by manufacturers.
- ☐ To help students to know the impact of IT revolution on manufacturing competitiveness
- ☐ To help students different international practices & models adopted by various organizations
- ☐ Understand various practices being taken up by Indian Industries
- ☐ To help students to know the maintenance management practices

Unit 1
Information Age and Global Competitiveness The Emergence of Information Age; Competition and Business Challenge; Operating Environment; Globalization and International Business; Global Competitiveness and Manufacturing Excellence; World Class Manufacturing and Information Age Competition; Manufacturing Challenges, Problems in Manufacturing Industry

Unit 2
Cutting Edge Technology&**Philosophy of World Class Manufacturing** :

Value Added Engineer in - Hall's Framework; Schonberger's Framework of WCM; Gunn's Model; Maskell'sModelEvolution of WCM; Ohno's View on WCM; Principles and Practices; Quality in WCM; Deming's & Shingo's Approach to Quality Management; Culmination of WCM, Generic Manufacturing Strategies for Information Age; Planning Methodology and Issues in Strategic Planning of WCM; Performance Measurement - PO-P System, TOPP System and Ambite System.

Unit 3:
System and Tools for World Class Manufacturing The Integration Imperative; Overview of Systems and Tools; Information Management Tools - Product and Process Design Tools, Bar Code Systems, Kanban: A Lean Production Tool, Statistical Quality Control (SQC), Material Processing and Handling Tools; Assessment of Manufacturing Systems and Tools.

Unit 4
Competitive Indian Manufacturing Manufacturing Performance and Competitiveness - Indian Firms: Manufacturing Objectives and Strategy; Usage of Management Tools and Technologies; Manufacturing Management Practices; IT Infrastructure and Practices; Strategic Intent Framework; Breadth and Integration of IT Infrastructure.

Unit 5
Function of maintenance management, dynamics of maintenance organization/ departments, types of maintenance system, maintenance planning and scheduling, universal maintenance practices, total productivity maintenance, emergencies and breakdown processes, Machine life depreciations, maintenance documentations & MIS

Case Studies Accelerated Fermentation Process – Using World Class Enzymes; Birla Cellulosic Kharach

References & Text books:

1. World Class Manufacturing- A Strategic Perspective by BS Sahay, KBS Saxena& Ashish Kumar, Publisher: Rajiv Beri for Macmillan India Ltd.

2. Making Common Sense Common Practice – Models for Manufacturing Excellence by Ron Moore, Publisher: Butter Worth Heinemann

3. The Toyota Way by Jeffrey K.Liker, Publisher: Tata McGraw Hill

4. Managing Technology & Innovation for Competitive Advantage by V. K. Narayanan, Publisher: Prentice Hall

5. World Class Manufacturing - The Lesson of Simplicity by Richard J Schonberger, Publisher: Free Press - A Division of Simon and Schuster

Course Outcomes

- Awareness about various models which intern help organization to bring excellence in their manufacturing systems
- Understanding of different tools used for enhancing excellence in manufacturing
- Understanding significance of IT in world class manufacturing practices
- Understanding different quality imperatives

Contract and Project Management

Code: RMB OP 05
Course Credits: 3 **Teaching Hours: 36 Hrs**

Objective:

- ☐ To develop basic concepts and theories of project management and feasibility study of projects.
- ☐ To develop conceptual skills, understanding and application of tools and techniques of Project management (CPM, PERT)in business practices.
- ☐ To familiarize about the design and implementation issues related to Project Life cycle.
- ☐ To familiarize about the various contracts associated with Project Management

Unit 1:
Introduction, objectives make and buy decisions, factors affecting contracting, law of contract in brief, Contract management process cycle, Types of contracts

Unit 2:
Understanding the project contract, D-B-B(Design, Bid, Build), D-B(Design, Build), B-O-T(Build, Operate, Transfer), Types of Constructions Contract, Cost plus fixed fee contract, Cost plus incentive fee, Cost plus award fee contract , Fixed price level contracts, Procurement processes in contract management

Unit 3:
Awarding works contracts, Contract management skills, Contract performance management, Incentives and penalties, Procedures for amendment in contracts, Contract and Project audit

Unit 4:
Defining Project Management, Project Cycle, Project Processes, Project Management Principles, Responsibilities of the Project manager, Project Evaluation and selection criteria, Different players in Project Management, their roles and responsibilities, Project Planning: Scoping, Work break down structure(WBS), Project Process Flows, Project customization

Unit 5:
Phases of project implementation, Project monitoring and control, Change in Project management process, Tools for changing processes, Project closure, Understanding risk project, Identify risk in project , Key project management process(PMBOK), Monitoring and controlling risk

Suggested Readings:

1. Chandra, Prasanna; *Project Management;* McGraw-Hill Education
2. Gopalakrishnan, P.; *Project Management* ; Macmillan
3. Cleland, David I.; *Project Management*; McGraw-Hill Education
4. Chawla, Rajni; *Project Management;* Wiley India
5. Lock, Denis; *Project Management;* Gower Publishing
6. Gray, C.F. and Larson, F.W.; *Project Management*; McGraw-Hill Education
7. Maylor, Harry; *Project Management*; Pearson Education.

Expected Course Outcomes:

- ☐ The students would be able to determine the feasibility of new projects.
- ☐ Students will improve upon their conceptual skills, understanding and application of tools and techniques of Project management in business practices in real time.
- ☐ The student would be able to identify the risks related to Project Management.
- ☐ The student would be having knowledge of various contracts associated with Project Management

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

(Computer Science and Engineering, Computer Engg. & Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE030, 032 to 037, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
4.	RCS301	Discrete Structures & Theory of Logic	3-0-0	70	20	10	100	3
5.	RCS302	Computer Organization and Architecture	3-0-0	70	20	10	100	3
6.	RCS305	Data Structures	3-1-0	70	20	10	100	4
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	RCS351	Discrete Structure & Logic Lab	0-0-2	50	30	20	100	1
9.	RCS352	Computer Organization Lab	0-0-2	50	30	20	100	1
10.	RCS355	Data Structures Using C/ Java Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
		TOTAL					**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE040, 042 to 047, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC405	Introduction to Microprocessor	3-0-0	70	20	10	100	3
4.	RCS401	Operating Systems	3-0-0	70	20	10	100	3
5.	RCS402	Software Engineering	3-0-0	70	20	10	100	3
6.	RCS403	Theory of Automata and Formal Languages	3-1-0	70	20	10	100	4
7.	RCS451	Operating Systems Lab	0-0-2	50	30	20	100	1
8.	RCS452	Software Engineering Lab	0-0-2	50	30	20	100	1
9.	RCS453	TAFL Lab	0-0-2	50	30	20	100	1
10.	RCS454	Python Language Programming Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

RCS301: DISCRETE STRUCTURES & THEORY OF LOGIC

UNIT I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

UNIT II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism’s, Definition and elementary properties of Rings and Fields, Integers Modulo n.

UNIT III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.

UNIT IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

UNIT V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, “Elements of Discrete Mathematics”, McGraw Hill
2. Jean Paul Trembley, R Manohar, “Discrete Mathematical Structures with Application to Computer Science”, McGraw-Hill
3. YN Singh, “Discrete Mathematical Structures”, Wiley India, New Delhi, First Edition, August 2010**.**
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and SC Ross, “Discrete Mathematical Structures”, PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, “Discrete Mathematics”Oxford Higher Education.
7. Biswal, “Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, “Discrete Mathematics with Graph Theory”, PHI Learning Private Limited, Delhi India.
9. Lipschutz, “Discrete Mathematics”, McGraw Hill
10. Deo N., “Graph Theory with Applications to Engineering and Computer Science”, PHI Learning Private Limited, Delhi India

RCS302: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I
Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT II
Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

UNIT III
Basic concept and hierarchy, semiconductor RAM memories, 2D & $2\frac{1}{2}D$ memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

UNIT IV
Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

UNIT V
Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, "Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2^{nd} Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

RCS305/ RCS405: DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.

Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.

Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

UNIT IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

UNIT V

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.

Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .

Hashing: Hash Function, Collision Resolution Strategies.

Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.

3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. AK Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

RCS351: DISCRETE STRUCTURE & LOGIC LAB

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

RCS352: COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

RCS355/RCS455: DATA STRUCTURE USING C/ JAVA LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

REC405: INTRODUCTION TO MICROPROCESSOR

UNIT I
Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

UNIT II
Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III
Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV
Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.
4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, "IBM PC Assembly language and programming", Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education.

RCS401: OPERATING SYSTEMS

UNIT I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

UNIT II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer/ Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

UNIT III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

UNIT V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

RCS402: SOFTWARE ENGINEERING

UNIT I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.

Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.

Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, “Software Engineering”, Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

RCS403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

UNIT I
Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

UNIT II
Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III
Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV
Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V
Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. YN Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya, AK "Theory of Computation and Application", BPaperback Publications
6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication.

7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.
10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.

RCS451: OPERATING SYSTEMS LAB

1. To implement CPU Scheduling Algorithms
    - FCFS
    - SJF
    - SRTF
    - PRIORITY
    - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
    - FIFO
    - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS452: SOFTWARE ENGINEERING LAB

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

RCS453: TAFL Lab

Understanding of software like JFLAP for experimenting with formal languages

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

RCS454: PYTHON LANGUAGE PROGRAMMING LAB

Write a Python program to: -

1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
    a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
    Sample String : 'abc'
    Expected Result : 'abcing'
    Sample String : 'string'
    Expected Result : 'stringly'
    b. To get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
6.
    a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
    b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers

Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python

Regular Expressions: re modules, match function, search function, modifiers and patterns

Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.

Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions

File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;

Simple Graphics: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.

Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database.

Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; aggregation and composition.

Reference books:

1. John M. Sewart, "Python for Scientist", Cambridge Universities Press.
2. Reema Thareja, "Python Programming" Oxford Higher Education.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python" Pearson
4. Mrak Litz, " Learning Python",O' Reilly
5. Mark Pilgrim, "Dive into Python", Apress
6. James L. Young, "Python made Simple and Practical", Kindle Edition (paperback)
7. Y. Daniel Liang "Introduction to Programming using Python" Pearson

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Study & Evaluation Scheme with Syllabus
for
B.Tech. Second Year

Electronics Engineering / Electronics & Communication Engineering / Electronics & Telecommunication Engineering / Electronics & Instrumentation Engineering / Instrumentation & Control Engineering / Applied Electronics & Control Engineering / Biomedical Engineering

On
Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REE305	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
4.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
5.	REC302	Electronic Devices and Circuits	3-1-0	70	20	10	100	4
6.	REC303	Signals & Systems	3-0-0	70	20	10	100	3
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	REC352	Electronic Devices and Circuits Lab	0-0-2	50	30	20	100	1
9.	REC353	Signals & Systems Lab	0-0-2	50	30	20	100	1
10.	REC354	Electronics Workshop & PCB Design Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2^{nd} Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC401	Microprocessors & Microcontrollers	3-0-0	70	20	10	100	3
4.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
5.	REC403	Electronic Measurement & Instrumentation	3-0-0	70	20	10	100	3
6.	RCS406	Data Structure & Algorithms	3-0-0	70	20	10	100	3
7.	REC451	Microprocessors & Microcontrollers Lab	0-0-2	50	30	20	100	1
8.	REC452	Advanced Electronics System Lab	0-0-2	50	30	20	100	1
9.	REC453	Electronic Measurement & Instrumentation Lab	0-0-2	50	30	20	100	1
10.	RCS456	Data Structure & Algorithms Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. II^{nd} year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REE305: NETWORK ANALYSIS & SYNTHESIS

UNIT I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

UNIT II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

UNIT III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

UNIT IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

UNIT V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. MS Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. ME Van Valkenberg, "Network Analysis", Prentice Hall of India Ltd.
2. Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning Pvt. Ltd

REC301: DIGITAL LOGIC DESIGN

UNIT I

Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

UNIT II

Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III

Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

UNIT V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

REC302: ELECTRONIC DEVICES AND CIRCUITS

UNIT I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

UNIT III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. AS Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, “Electronic Devices and Circuits”, Tata McGraw Hill.
3. BG Streetman and S. Banerjee “Solid State Electronics Devices”, Prentice Hall of India.

Reference Books:

1. Donald A. Neamen “Semiconductor Physics & Devices”, Tata McGraw Hill.
2. Alok K. Dutta, “Semiconductor Devices and Circuits”, Oxford University Press.
3. Jacob Millman and Arvin Grabel, “Microelectronics”, Tata McGraw Hill.

REC303: SIGNALS & SYSTEMS

UNIT I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

UNIT II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems.

UNIT III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

UNIT IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

UNIT V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Book:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, ‘Signals and Systems’, Pearson Education.
2. TK Rawat, “Signals and Systems”, Oxford University Press.

Reference Books:

1. BP Lathi, “Principals of Linear Systems and Signals”, Oxford University Press.
2. P. Ramakrishna Rao, ‘Signal and System’, Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, “Probability & Statistics with Reliability Queuing and Computer Science Applications”, Wiley Publication.

REC351: DIGITAL LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

REC352: ELECTRONIC DEVICES AND CIRCUITS LAB

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

REC353: SIGNALS & SYSTEMS LAB

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two- and three-dimensional plots.
    b. Write a MATLAB program to plot the following Continuous time and discrete time signals
        1. Step Function
        2. Impulse Function
        3. Exponential Function
        4. Ramp Function
        5. Sine Function
3. Time and Amplitude transformations
    a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
    a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier Series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier Series as a function of time
    c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier Transform of a given signal
    b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
    b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

REC354: ELECTRONICS WORKSHOP & PCB DESIGN LAB

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

RCS406: DATA STRUCTURE & ALGORITHMS

UNIT I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

UNIT III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element, Trees and their applications: C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

UNIT IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

UNIT V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Book:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Reema Theraja, “Data Structure using C”, OUP Publication.

References Books:

1. E. Balagurusamy, “Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. TH Koreman, “Introduction to Algorithms“, MIT Press.

REC401: MICROPROCESSORS & MICROCONTROLLERS

UNIT I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts, Programming using interrupts, Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming.

UNIT III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption.

UNIT IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning.

Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID.

Text Book:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram International Publication (India) Pvt. Ltd.
2. DV Hall, “Microprocessors Interfacing”, Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880

5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. AK Roy & KM Bhurchandi, “Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)”, Tata McGraw Hill Publication.

REC402: ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate Systems and Transformation :

Basics of Vectors: Addition, subtraction and multiplications**;** Cartesian, Cylindrical, Spherical transformation.

Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form
Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

REC403: ELECTRONIC MEASUREMENT AND INSTRUMENTATION

UNIT I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.

Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.

PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

UNIT II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System.

UNIT III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

UNIT IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

UNIT V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers.

Text Book:

1. David A. Bell, “Electronic Instrumentation and Measurements”, Oxford University Press.

Reference Books:

1. Oliver and Cage, “Electronic Measurements and Instrumentation”, Tata McGraw Hill Publication.
2. Alan S. Morris, “Measurement and Instrumentation Principles”, Elsevier (Buterworth Heinmann).

REC451: MICROPROCESSORS AND MICROCONTROLLERS LAB

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately

   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.

   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.

   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:

   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

   Exercises:

   a) How many Low power modes are supported by the MSP430G2553 platform?

   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises:

   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.

Exercises:

a) Alter the threshold to 75% of Vcc for the LED to turn on.

b) Modify the code to change the Reference Voltage from Vcc to 2.5V.

8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

Exercises:

a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?
b) Create a PWM signal of 75% duty cycle on particular PWM pin.
c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

Exercises:

a) How does the ULP Advisor software help in designing power-optimized code?
b) Which ULP rule violation helps us to detect a loop counting violation?
c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

Exercise:

Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

char str1[]="MSP430G2 launchpad"

char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

Exercises:

a) Which port pins of MSP430 can be configured for SPI communication?

b) What is the data transfer rate supported by MSP430 for SPI communication?

REC452: ADVANCED ELECTRONICS SYSTEM LAB

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
    - *DC biasing of Common Source
    - *MOSFET Common Source Amplifier
    - *MOSFET Source Follower
    - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

- MOSFET based Ring oscillators
- MOSFET based Relaxation oscillators
- MOSFET based Voltage-controlled oscillators
- Integration of crystal oscillator into circuits

Data Conversion

- Analog to Digital Conversion
    - * Successive Approximation ADC
- Digital to Analog Conversion
    - * Scaled Resistor Network

System Considerations

- System-level stability: decoupling, ground loops
- Basics of EMC and screening
- Examples of complete electronic systems

REC453: ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

RCS456: DATA STRUCTURE AND ALGORITHMS LAB

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
   a. Searching (Linear Search, Binary Search)
   b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
   c. Merging
4. Implementation of Link List
   a. Creation of Singly link list, Doubly Linked list
   b. Concatenation of Link list
   c. Insertion and Deletion of node in link list
   d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
   a. Array
   b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
   a. Depth First Search
   b. Breadth First Search
   c. Prim`s Algorithm
   d. Kruskal`s Algorithms
9. Implementation of Hash Table

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Study & Evaluation Scheme with Syllabus
for
B.Tech. Second Year
Electrical Engineering / Electrical & Electronics Engineering

On
Choice Based Credit System
(Effective from the Session: 2017-18)

2^{nd} Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC309	Analog & Digital Electronics	3-0-0	70	20	10	100	3
4.	REE301	Electrical & Electronics Engineering Materials	3-0-0	70	20	10	100	3
5.	REE302	Electrical Measurements & Instrumentation	3-0-0	70	20	10	100	3
6.	REE303	Basic Signals & Systems	3-1-0	70	20	10	100	4
7.	REE351	Electrical Workshop	0-0-2	50	30	20	100	1
8.	REE352	Electrical Measurements Lab	0-0-2	50	30	20	100	1
9.	REE353	Simulation Lab – I	0-0-2	50	30	20	100	1
10.	REC359	Electronics Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. II^{nd} year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
4.	REE401	Power Plant Engineering	3-0-0	70	20	10	100	3
5.	REE402	Electrical Machines -I	3-0-0	70	20	10	100	3
6.	REE405	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
7.	REE451	Simulation– II Lab	0-0-2	50	30	20	100	1
8.	REE452	Electrical Machines -I Lab	0-0-2	50	30	20	100	1
9.	REE453	Networks Lab	0-0-2	50	30	20	100	1
10.	REE454	Electrical Instrumentation Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REC309: ANALOG & DIGITAL ELECTRONICS

UNIT I

Special Diodes-LED, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications.
Introduction to Power devices- Characteristics of SCR, TRIAC, DIAC.

UNIT II

Amplifier and Frequency Response-Introduction to Amplifier, Transfer Function, Frequency Response of Common Emitter, Multistage amplifier. Frequency response of Common source MOSFET Amplifier.

UNIT III

Feedback- General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.
Oscillators-Basic principle of sinusoidal oscillator, R-C Phase Shift , Wein Bridge oscillators, tuned oscillators- Collpits and Hartley; Crystal oscillator, CLAP Oscillator.

UNIT IV

Number System, Gate Level Minimization (up to three Variables), SOP, POS Simplification.
Combinational Logic Circuits: Binary Adder/ Subtractor, Multiplexer/ Demultiplexer, Decoder/ Encoder
Sequential Logic: Introduction to latches, flip-flops- S-R, T, D, J-K.

UNIT V

Registers & Counter: Serial and parallel data transfer, shift left/right registers, universal shift register. Mode N Counters, ripple counters, synchronous counters, Ring/Johnson counters.
Memory: Introduction to ROM, RAM, PLA, PAL.

Text Books:

1. AS Sedra and K.C. Smith "Microelectronics Circuits" Oxford University Press (India)
2. Malvino& Leach, "Digital Principles and applications" Tata Mc. Graw Hill
3. RA Gayakwad "Op amps and Linear Integrated Circuits" Prentice Hall of India.
4. Balbir Kumar and ShailB. Jain, "Electronic Devices and Circuits" Prentice Hall of India, 2007

Reference Books:

1. Taub & Schilling "Digital Electronics"- Tata McGraw Hill
2. Anil K. Maini, "Digital Electronics: Principles and Integrated circuits" Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, "Microelectronics" McGraw Hill
4. Anand Kumar, "Switching Theory and Logic Design" Prentice Hall of India, 2008.
5. Aloke. K. Dutta, "Semiconductor Devices and circuits", Oxford University Press, 2008.

REE301: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

UNIT I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

UNIT III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT IV

Materials For Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation.

UNIT V

Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI Reading.

Text Books:

1. RK Rajput, A course in Electrical Engineering Materials, Laxmi Publications, 2009
2. TK Basak, A course in Electrical Engineering Materials, New Age Science Publications, 2009
3. Adrianus J. Dekker, Electrical Engineering Materials, Pearson, 2016.

Reference Books:

1. TTTI Madras, Electrical Engineering Materials
2. C S Indulkar & S Thiruvengadam, Electrical Engineering Materials

REE302: ELECTRICAL MEASUREMENTS & INSTRUMENTATION

UNIT I
Electrical Measurements: Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Review of indicating and integrating instruments: Voltmeter, Ammeter, Three phase Wattmeter, Multimeter and Energy meter.

UNIT II
Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances, insulation resistance measurement, AC bridges for inductance and capacitance measurement.

UNIT III
Instrument Transformers: Current and Potential transformer, ratio and phase angle errors, design considerations and testing.

UNIT IV
Electronic Measurements: Electronic voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Spectrum & Wave analyzer. Digital counter, frequency meter, voltmeter, multimeter and storage oscilloscope.

UNIT V
Instrumentation: Transducers, classification & selection of transducers, strain gauges, Thermistors, Thermocouples, LVDT, Inductive & capacitive transducers, Piezoelectric and Hall-effect transducers, Measurement of motion, force, pressure, temperature, flow and liquid level, basic concepts of smart sensors and application. Data Acquisition Systems.

Text Book:
1. A K Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
2. BC Nakra & K. Chaudhary, "Instrumentation, Measurement and Analysis," Tata McGraw Hill 2nd Edition
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH

Reference Books:
1. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
2. M. Stout , "Basic Electrical Measurement", Prentice Hall of India
3. WD Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
4. EW Golding & F.C. Widdis, "Electrical Measurement &Measuring Instrument", AW Wheeler & Co. Pvt. Ltd. India

REE303: BASIC SIGNALS & SYSTEMS

UNIT I

Introduction To Continuous Time Signals And Systems: Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties.

Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

UNIT II

Fourier Transform Analysis: Exponential form and Compact trigonometric form of Fourier series, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.

UNIT-III

Laplace Transform Analysis: Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms.

UNIT IV

State – Variable analysis: Introduction, State Space representation of linear systems, Transfer function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State – Variable technique to the analysis of linear systems.

UNIT-V

Z – Transform Analysis: Concept of Z – Transform, Z – Transform of common functions, Inverse Z – Transform, Initial & Final value Theorems, Applications to solution of difference equations, Properties of Z-transform.

Text Books:

1. Oppenhiem, Wilsky, Nawab, "Signals & Systems", PHI
2. Anand Kumar, " Signals & Systems", PHI
3. Choudhary D. Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

1. David K. Cheng; "Analysis of Linear System", Narosa Publishing Co
2. Donald E. Scott, "Introduction to circuit Analysis" Mc. Graw Hill
3. BP Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
4. IJ Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Signals and Systems", Tata Mc.Graw Hill, 2001.
5. ME Van-Valkenberg; " Network Analysis", Prentice Hall of India

REE351: ELECTRICAL WORKSHOP

Note: Minimum ten experiments are to be performed from the following list:

1. To study the working and Control of two lamps in series and in parallel
2. To perform the stair case working and it's testing.
3. To study the working principle and wiring of fluorescent lamp.
4. To study and wiring of distribution board including power plug using isolator, MCB, ELCB.
5. To study and estimate a typical, BHK house wiring.
6. Familiarization, soldering, testing and observing the wave forms on CRO of a HW and FW uncontrolled rectifier (using diodes) with capacitor filter.
7. Visit your college substation and familiarize the supply system, Transformer, HT Panel and Distribution etc.
8. To study construction, working and application of workshop tools. Also study the Electrical and Electronics Symbols.
9. To study the wires, cables and their gauges, Domestic Electrical Accessories.
10. Mini Project on PCB.
11. To study fault, Remedies in Domestic Installation and Indian Electricity Rules.
12. To study the different types of earthing system and measure the earth resistance.

REE352: ELECTRICAL MEASUREMENTS LAB

Note: Minimum ten experiments are to be performed from the following list:

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance by Maxwell's Bridge.
3. Measurement of inductance by Hay's Bridge.
4. Measurement of inductance by Anderson's Bridge.
5. Measurement of capacitance by Owen's Bridge.
6. Measurement of capacitance by De Sauty Bridge.
7. Measurement of capacitance by Schering Bridge.
8. Measurement of low resistance by using Kevin's Double bridge.
9. Measurement of phase difference and frequency of AC signal using CRO.
10. Measurement of Power using CT & PT.
11. Measurement of iron loss in a ring by using Maxwell's Bridge.
12. To measure high resistance by using loss of charge method.

REE353: SIMULATION LAB - I

Note: Minimum ten experiments are to be performed from the following list:

1. Introduction to MATLAB and its basic commands
2. Determine the root of a polynomial
3. Determination of polynomial using method for least square curve fitting
4. Solution of differential equation using 4th order runge - kutta method
5. Determination of time response of an RLC circuit
6. Single line Modeling of DC motor
7. Step, Ramp and impulse response of transfer function
8. Generation of single and three phase sinusoidal waveform
9. PWM based waveform generation
10. Single phase uncontrolled half wave rectifier using R and RL load
11. Single phase uncontrolled full wave rectifier using R and RL load
12. Three phase uncontrolled full wave rectifier using R and RL load

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REC359: ELECTRONICS LAB

ANALOG ELECTRONICS:

Note: Select at least any five out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any five out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and mono-stable multi vibrators.
11. To study operation IC 555 based astable and mono-stable multi vibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

REE401: POWER PLANT ENGINEERING

UNIT I

Hydro-electric power plants – selection of site, elements of power plant, classification, water turbines, governor action, hydro-electric generator, plant layout, pumped storage plants.

UNIT II

Thermal Steam power plants – selection of site, elements and operational circuits of the power plant, turbo-alternators, plant layout, steam turbines, controls and auxiliaries.

UNIT III

Nuclear power plants – selection of site, nuclear reaction – fission process and chain reaction, constituents of power plant and layout, nuclear reactor – working, classification, control, shielding and waste disposal.

UNIT IV

Renewable power plants – Solar power generation – Photo-voltaic and solar thermal generation – solar concentrators, Wind power generation – types of wind mills, wind generators, tidal, biomass, geothermal and magneto-hydro dynamic power generation, micro-hydel power plants, fuel cells and diesel and gas power plants.

UNIT V

Combined operation of power plants – plant selection, choice of size and number of generator units, interconnected systems, real and reactive power exchange among interconnected systems. Power plant economics: load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants, Economic Load Sharing.

Text Books:

1. Chakrabarti A., Soni M.L., Gupta P.V., and Bhatnagar U.S., 'A text book on Power Systems Engg.', DhanpatRai and Sons, New Delhi, 2nd revised edition, 2010.
2. JB Gupta, ‘A course in Power Systems’, S.K. Kataria and sons, reprint 2010-2011.

Reference Books:

1. Wadhwa, C.L., ‘Generation Distribution and Utilization of Electrical Energy', New Age International publishers, 3rd edition, 2010.
2. Deshpande M.V, `Elements of Electrical Power systems Design’, Pitman, New Delhi, PHI Learning Private Limited, 1st edition, 2009**.**

REE402: ELECTRICAL MACHINES - I

UNIT I

Principles of Electro-mechanical Energy Conversion: Introduction, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy, concept of Doubly excited system, Generation of EMF in Machines, Torque in machine with cylindrical air gap.

UNIT II

DC Machines: Construction, Classification and circuit model of DC Machines, Armature winding (Concentrated and Distributed), Winding Factor, EMF and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators, Series and Parallel operation of the DC Generator, Applications.

UNIT III

DC Machines (Contd.): Performance characteristics of DC motors, Starting of DC motors; 3 point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Leonard method); Efficiency and Testing of DC machines (Hopkinson's and Swinburne's Test), Applications.

UNIT IV

Single Phase Transformer: Construction, EMF Equation, Equivalent Circuit, Phasor diagram, Efficiency and voltage regulation, All day efficiency.
Testing of Transformers- O.C. and S.C. tests, Polarity test, Sumpner's test,
Auto Transformer- Single phase and three phase autotransformers, Volt-amp relation
Copper saving in autotransformer Efficiency, Merits & demerits and applications.

UNIT V

Three Phase Transformers: Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Three winding transformers, Excitation phenomenon and harmonics in transformers.

Text Books:

1. IJ Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad , "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher
4. AE Fitggerald, C. Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

1. H. Cotton, "Electrical Technology", CBS Publication.
2. MG Say, "The Performance and Design of AC machines", Pit man& Sons.
3. PS Bimbhra, " Generalized Theory.

REE405: NETWORK ANALYSIS AND SYNTHESIS

Unit I

Graph Theory: Importance of Graph Theory in Network Analysis**,** Graph of a network, Definitions, planar & Non Planar Graphs, Isomorphism, Tree, Co Tree, Link, basic loop and basic cutset, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis.

Unit II

Network Theorems (Applications to dependent & independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's Theorem.

Unit III

Transient Circuit Analysis: Natural response and forced response, Transient response andsteady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit IV

Network Functions: Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.

Two Port Networks- Characterization of LTI two port networks; Z, Y,ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation, terminated two Port networks, Image Impedance.

Unit V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RCand RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters.

Text Books:

1. ME Van Valkenburg, "Network Analysis", Prentice Hall of India.
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill.
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. CL Wadhwa, "Network Analysis and Synthesis", New Age International Publishers.
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill.
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill.
3. ME Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T.S.K.V. Iyer, "Circuit Theory", Tata McGraw Hill.
5. Samarjit Ghosh, " Network Theory: Analysis & Synthesis" Prentice Hall India.

REE451: SIMULATION-II LAB

Note: Minimum ten experiments are to be performed from the following list

1. Design of three phase inverter using R and RL Load
2. Design of DC to DC converter using R and RL Load
3. Simulate the response of DC machine using three phase rectifier
4. Simulate the response of DC machine using PID controller
5. Simulate the response of Induction machine using three phase inverter
6. Simulate the response of synchronous machine using three phase inverter
7. Introduction to fuzzy system toolbox
8. Speed control of DC machine using fuzzy system
9. Introduction to neural network toolbox
10. Load forecasting of power system using neural network
11. Introduction to Genetic Algorithm
12. Least square curve fitting using Genetic Algorithm

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE452: ELECTRICAL MACHINES-I LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a DC shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a DC shunt motor.
6. To obtain speed control of DC shunt motor using (a) armature resistance control (b) field control
7. To obtain speed control of DC separately excited motor using Ward-Leonard.
8. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.
12. To demonstrate the parallel operation of three phase Transformer and to obtain the load sharing at a particular load.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE453: NETWORKS LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. Verification of principle of superposition with AC sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in AC circuits.
3. Verification of Tellegen's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for
6. under damped, critically damped and over damped cases.
7. Determination of frequency response of current in RLC circuit with sinusoidal AC input.
8. Determination of z and h parameters (DC only) for a network and computation of Y and ABCD Parameters.
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
11. Verification of parameter properties in inter-connected two port networks: series, parallel
12. and cascade. Also study loading effect in cascade.
13. Determination of frequency response of a Twin – T notch filter.
14. To determine attenuation characteristics of a low pass / high pass active filters.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE454: ELECTRICAL INSTRUMENTATION LAB

Note: Minimum ten experiments are to be performed from the following list

1. Measurement of displacement using LVDT.
2. Measurement of load using strain gauge based load cell.
3. Measurement of water level using strain gauge based water level transducer
4. Measurement of temperature by RTD.
5. Design and Test a signal conditioning circuit for any transducer.
6. Simulate and analyze the frequency domain measurement of electrical signals using spectrum analyzer.
7. Study of PID controllers in flow measurement.
8. Measurement of flow rate by anemometer.
9. Measurement of solar energy using sensor.
10. Implementation of Color Sensor for differentiating frequencies.
11. Determine rotational speed and angle of a motor shaft using Encoder.
12. Range finding and object detection using detection sensor.
13. Measurement using various sensors and analyzing the output using Lab-VIEW software.
14. Design a circuit for noise reduction in measurement system.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

(Mechanical Engineering/ Production Engineering, Industrial & Production Engineering, Mechanical & Industrial Engineering, Manufacturing Technology, Automobile Engineering, Aeronautical Engineering)

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2^{nd} Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	Th/Lab ESE	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE031 to 036, 038, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	RCE303	Fluid Mechanics	3-0-0	70	20	10	100	3
4.	RME301	Material Science	3-0-0	70	20	10	100	3
5.	RME302	Thermodynamics	3-1-0	70	20	10	100	4
6.	RME303	Mechanics of Solids	3-0-0	70	20	10	100	3
7.	RCE353	Fluid Mechanics Lab	0-0-2	50	30	20	100	1
8.	RME351	Material Science & Testing Lab	0-0-2	50	30	20	100	1
9.	RME352	Thermodynamics Lab	0-0-2	50	30	20	100	1
10.	RME353	Computer Aided Machine Drawing–I Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE041 to 046, 048, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REE409	Electrical Machines & Controls	3-0-0	70	20	10	100	3
4.	RME401	Measurement and Metrology	3-0-0	70	20	10	100	3
5.	RME402	Manufacturing Science & Technology-I	3-0-0	70	20	10	100	3
6.	RME403	Applied Thermodynamics	3-1-0	70	20	10	100	4
7.	REE459	Electrical Machines and Controls Lab	0-0-2	50	30	20	100	1
8.	RME451	Measurement and Metrology Lab	0-0-2	50	30	20	100	1
9.	RME452	Manufacturing Science & Technology–I Lab	0-0-2	50	30	20	100	1
10.	RME453	Computer Aided Machine Drawing-II Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

NOTE: Practical summer training-1 of 4-weeks after IV semester or Minor fabrication project will be evaluated in VII semester.

Science Based Open Electives:

a. ROE031/ROE041 Introduction to soft computing
b. ROE032/ROE042 Nano Science
c. ROE033/ROE043 Laser System and Application
d. ROE034/ROE044 Space Science
e. ROE035/ROE045 Polymer Science & Technology
f. ROE036/ROE046 Nuclear Science
g. ROE038/ROE048 Discrete Mathematics
h. ROE039/ROE049 Applied Linear Algebra

RME301: MATERIAL SCIENCE

UNIT I

Introduction: Importance of materials, historical perspective, Future aspects of engg. materials.

Crystal Structure: brief on BCC, FCC and HCP Structures, coordination number and atomic packing factors. Bravais lattices, Miller indices, crystal imperfections-point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

Ferrous and non- ferrous materials: Properties, Composition and uses of Grey cast iron, malleable iron, SG iron and steel, copper alloys-brasses and bronzes, Aluminium alloys. Introduction to BIS & ASTM codes and practice on material and testing.

UNIT II

Mechanical Behaviour: Stress-strain diagram showing ductile and brittle behaviour of materials, mechanical properties in plastic range, yield strength off set yield strength, ductility, ultimate tensile strength, toughness, Plastic deformation of single crystal by slip and twinning, Hardness Tests.

Fracture Creep Fatigue: Fracture: Type I, Type II and Type III. Creep: Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation. Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

UNIT III

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures. Phase Diagram I: Solid solutions Hume Rothary rule, substitutional and interstitial solid solutions, intermediate phases, Gibbs phase rule.

Phase Diagram: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

UNIT IV

Heat Treating of Metals: TTT curves, continuous cooling curves, annealing and its types. Normalizing, hardening, tempering, mastempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction hardening, age hardening of aluminium-copper alloys.

Comparative study of microstructure of various Ferrous, nonferrous metals and alloys.

UNIT V

Composite materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

Ceramics: Structure types and properties and applications of ceramics. Mechanical/ Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/ plastics and its applications. Mechanical behaviour and processing of plastics, Future of plastics. Introduction to Smart materials & Nano-materials and their potential applications.

Books and References:

1. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd.

2. Elements of Material Science & Engineering by Van Vlack, Pearson
3. Material Science and Engineering by Smith, Hashemi and Prakash, MCGRAW HILL INDIA
4. The Science and Engineering of materials, by Askeland & Balani, Cengage Learning
5. Introduction to Materials Science for Engineers by Shackelford, Pearson
6. Material Science by Narula, MCGRAW HILL INDIA.
7. Materials Science and Engineering - A First Course by Raghavan, PHI
8. Material Science and Engineering Properties by Gilmore, Cengage Learning
9. Material Science for Engineering Students by Fischer, Academic Press
10. Technology of Engineering materials by Philip and Bolton, Butterworth-Heinamann

RME302: THERMODYNAMICS

UNIT I

Review of Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases. **Zeroth law of thermodynamics:** Concept of Temperature and its' measurement, Temperature scales.

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

UNIT II

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables &Mollier chart, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

Air-water vapour mixture and Psychrometry: Psychometric terms and their definitions, Psychometric chart, Different Psychometric processes and their representation on Psychometric chart.

UNIT V

Refrigeration Cycles: Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration.Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system.

Books and References:

1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.
6. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
7. Engineering Thermodynamics by Dhar, Elsevier.
8. Engineering Thermodynamics by Onkar Singh, New Age International.
9. Engineering Thermodynamics by CP Arora.
10. Engineering Thermodynamics by Rogers, Pearson.
11. Fundamentals of Engineering Thermodynamics by Moran, Shapiro, Boettner, & Bailey, John Wiley.
12. Engineering Thermodynamics by Mishra, Cengage Learning
13. Refrigeration and Air Conditioning by C P Arora, MCGRAW HILL INDIA

RME303: MECHANICS OF SOLIDS

UNIT I

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclines sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure. Thermal Stresses.

UNIT II

Stresses in Beams: Pure Bending**,** normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams
Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

UNIT III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.
Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Ranking Gordon formulae, examples of columns in mechanical equipments and machines.

UNIT IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.
Thick cylinders:
Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

UNIT V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.
Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Yσungs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Material by Rattan, MCGRAW HILL INDIA
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

RME351: MATERIALS SCIENCE AND TESTING LAB

In this lab Experiments on Material Science and Experiments on Material Testing are to be conducted as given below:

(A). Experiments on Material Science (at least 5 of the following):

1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & micro examination of the welded specimen.
10. Study of Magnetic/ Electrical/Electronic materials.

(B) Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact test on impact testing machine like Charpy, Izod or both.
4. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index test on spring testing machine.
6. Fatigue test on fatigue testing machine.
7. Creep test on creep testing machine.
8. Experiment on deflection of beam, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion test of a rod using torsion testing machine.
10. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

RME352: THERMODYNAMICS LAB

Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance sheet for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment(s) on thermodynamics

RME353: COMPUTER AIDED MACHINE DRAWING-I LAB

Introduction (1 drawing sheets)
Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

Orthographic Projections (3 drawing sheets)
Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

Fasteners (2 drawing sheets)
Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

Riveted joints (1 drawing sheet)
Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

Assembly drawing (2 drawing sheets)
Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

Free hand sketching (1 drawing sheet**)**
Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

Computer aided drafting (1 drawing**)**
Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

REE409: ELECTRICAL MACHINES & CONTROLS

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests. **Three Phase Transformer:** Three phase transformer connections, 3-phase to 2-phase or 6-phase connections and their applications. **Auto Transformer:** Volt- Amp relations, efficiency, advantages & disadvantages, applications. **D.C. Motors:** Concept of starting, speed control, losses and efficiency.

UNIT II

Three phase Induction Motor: Construction, equivalent circuit, torque equation and torque-slip characteristics, speed control. **Alternator:** Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. **Synchronous Motor:** Starting, effect of excitation on line current (V-curves), synchronous condenser. **Servo Motor:** Two phase A.C. servo motor & its application.

UNIT III

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, electrical analog of simple mechanical systems; concept of transfer function & its determination for simple systems. **Control System:** Open loop & closed loop controls, servo mechanisms; concept of various types of system. **Signals:** Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics**.**

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants. **Stability:** Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations; Polar plot, Nyquist stability Criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. **Frequency Response Analysis:** Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots. **Process control:** Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text and Reference Books:

1. IJ Nagrath & D. P. Kothari, “Electrical machines” Tata McGraw Hill.
2. BR Gupta & Vandana Singhal, “Fundamentals of Electrical Machines”, New Age International.
3. K. Ogata, “Modern Control Engineering” Prentice Hall of India.
4. BC Kuo, “Automatic Control systems.” Wiley India Ltd.
5. Irvin L. Kosow, “Electric Machinery and Transformers” Prentice Hall of India.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, Control Systems: Principles and Design” Tata McGraw Hill.

RME401: MEASUREMENT AND METROLOGY

UNIT I

Mechanical Measurements: Introduction to measurement and measuring instruments. General concept–Generalized measurement system and its elements-Unit sand standards-measuring instruments: sensitivity, stability, range, accuracy and precision-static and dynamic response- repeatability-systematic, Source of error, statistical analysis of error and random errors- correction, calibration. Dimensional and geometric tolerance

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

UNIT II

Time Related Measurements: Stroboscope, frequency measurement by direct comparison. Measurement of displacement

Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

UNIT III

Flow Measurement: Hot Wire Anemometry, Laser Doppler Velocimetry, Rotameter

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers.

Measurements of Force, Torque: Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments

Measurements of Acceleration, and Vibration: Accelerometers vibration pickups and decibel meters, vibrometers.

UNIT IV

Coordinate measuring machine (CMM): Need, constructional features and types,

Metrology and Inspection: Standards of linear measurement, line and end standards. Interchange ability and standardization. Linear and angular measurements devices and systems **Comparators:** Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design.

UNIT-V

Limits, Fits &Tolerance and Surface roughness: Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness. Measurement of geometric forms like straightness, flatness, roundness. Tool makers microscope, profile projector, autocollimator.

Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:

1. Experimental Methods for Engineers by Holman, MCGRAW HILL INDIA
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, MCGRAW HILL INDIA
5. Measurement Systems, Application Design by Doeblein, MCGRAW HILL INDIA
6. Hume KJ, "Engineering Metrology", MacDonald and Co
7. Jain, RK, "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers
9. Gupta SC, Engineering Metrology, Dhanpat Rai Publications

RME402: MANUFACTURING SCIENCE & TECHNOLOGY-I

UNIT I

Introduction: Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items. **Metal Forming Processes**: Elastic & plastic deformation, yield criteria (Mises' and Tresca's). Hot working versus cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.

UNIT II

Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. Design, lubrication and defects in metal forming processes.

UNIT III

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load (capacity) needed. Analysis of forming process like cup/deep drawing. Bending & spring-back.

UNIT IV

Casting (Foundry): Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting, Sand casting, defects & remedies and inspection. Cupola furnace. Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO_2 casting and Stir casting etc.

UNIT V

Unconventional Metal forming processes: Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming. **Powder Metallurgy**: Introduction to Powder metallurgy manufacturing process. Application and, advantages. **Jigs & Fixtures**: Locating & Clamping devices & principles. Jigs and Fixtures and its applications. **Manufacturing of Plastic components**: Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by PC Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA
5. Manufacturing Processes by Lindberg, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson
7. Materials and Manufacturing by Paul Degarmo.
8. Manufacturing Processes by Kaushish, PHI
9. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
10. Production Technology by RK Jain

EME403: APPLIED THERMODYNAMICS

UNIT I

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles.

I.C. Engine: Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

UNIT II

Vapour Power cycles: Rankine cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration.

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines, Comparison with steam engine.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, MCGRAW HILL INDIA
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI
5. Theory of Stream Turbine by WJ Kearton

6. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man
7. Gas Turbine, by V. Ganeshan, Tata McGraw Hill Publishers.
8. Steam & Gas Turbine by R. Yadav, CPH Allahabad
9. Thermodynamics and Energy Systems Analysis, Borel and Favrat, CRC Press
10. Thermodynamics by Prasanna Kumar, Pearson
11. Thermal Engineering by Kulshrestha, Vikas Publishing.
12. Thermal Engg. By PL Ballaney, Khanna Publisher
13. Thermal Engg. By RK Rajput, Laxmi Publication

REE459: ELECTRICAL MACHINES & CONTROLS LAB

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Control Systems

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To obtain 3-phase to 2-phase conversion using Scott connection.
7. To perform load test on a 3-phase induction motor and determine (a) speed- torque characteristics (b) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Control Systems:

1. To determine transient response of a second order system for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an a.c. 2-phase servo motor.
4. To study and calibrate temperature using Resistance Temperature Detector(RTD)
5. To study dc servo position control system within P and PI configurations.
6. To study synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

RME451:MEASUREMENT & METROLOGY LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sine bar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. Experiment on measurement of pressure.
11. Study of temperature measuring equipments.
12. Measurement using Strain gauge.
13. Measurement of speed using stroboscope.
14. Experiment on measurement of flow.
15. Measurement of vibration/power.
16. Experiment on dynamometers.

17 To study the displacement using LVDT.

RME452 :MANUFACTURING TECHNOLOGY-I LAB

Minimum 8 experiments out of following (or such experiment) are to be performed:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

RME453: COMPUTER AIDED MACHINE DRAWING-II LAB

Note: All drawing conform to BIS Codes.

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts. List of Standard Abbreviation used.

Part Modeling: Introduction to part modeling of simple machine components using any 3D software (like CATIA, PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model ***(Minimum 24 machine components need to be developed).***

Part Modeling & Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing by K.R. Gopalakrishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria & Sons
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age publications
5. Engineering Graphics with AutoCAD, Bethune, PHI
6. Machine Drawing, N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus

For

B.Tech. Second Year

(Computer Science and Engineering, Computer Engg. & Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS301/ ROE030, 032 to 037, 039	Mathematics-III/ Science Based OE	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics / Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
4.	RCS301	Discrete Structures & Theory of Logic	3-0-0	70	20	10	100	3
5.	RCS302	Computer Organization and Architecture	3-0-0	70	20	10	100	3
6.	RCS305	Data Structures	3-1-0	70	20	10	100	4
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	RCS351	Discrete Structure & Logic Lab	0-0-2	50	30	20	100	1
9.	RCS352	Computer Organization Lab	0-0-2	50	30	20	100	1
10.	RCS355	Data Structures Using C/ Java Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/040 Manufacturing Process
b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE040, 042 to 047, 049/ RAS401	Science Based OE/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC405	Introduction to Microprocessor	3-0-0	70	20	10	100	3
4.	RCS401	Operating Systems	3-0-0	70	20	10	100	3
5.	RCS402	Software Engineering	3-0-0	70	20	10	100	3
6.	RCS403	Theory of Automata and Formal Languages	3-1-0	70	20	10	100	4
7.	RCS451	Operating Systems Lab	0-0-2	50	30	20	100	1
8.	RCS452	Software Engineering Lab	0-0-2	50	30	20	100	1
9.	RCS453	TAFL Lab	0-0-2	50	30	20	100	1
10.	RCS454	Python Language Programming Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
TOTAL							**1000**	**24**

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***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

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b. ROE032/042 Nano Science
c. ROE033/043 Laser System and Application
d. ROE034/044 Space Science
e. ROE035/045 Polymer Science & Technology
f. ROE036/046 Nuclear Science
g. ROE037/047 Material Science
h. ROE039/049 Applied Linear Algebra

RCS301: DISCRETE STRUCTURES & THEORY OF LOGIC

UNIT I

Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.

UNIT II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphism's, Definition and elementary properties of Rings and Fields, Integers Modulo n.

UNIT III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.

UNIT IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

UNIT V

Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring.
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Discrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, "Discrete Mathematical Structures with Application to Computer Science", McGraw-Hill
3. YN Singh, "Discrete Mathematical Structures", Wiley India, New Delhi, First Edition, August 2010**.**
4. RP Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,

5. B. Kolman, R.C. Busby, and SC Ross, “Discrete Mathematical Structures”, PHI Learning Private Limited, Delhi India.
6. Norman L. Biggs, “Discrete Mathematics”Oxford Higher Education.
7. Biswal, “Discrete Mathematics and Graph Theory, PHI Learning Private Limited, Delhi India.
8. Goodaire and Parmenter, “Discrete Mathematics with Graph Theory”, PHI Learning Private Limited, Delhi India.
9. Lipschutz, “Discrete Mathematics”, McGraw Hill
10. Deo N., “Graph Theory with Applications to Engineering and Computer Science”, PHI Learning Private Limited, Delhi India

RCS302: COMPUTER ORGANIZATION AND ARCHITECTURE

UNIT I

Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer, Processor organization, general register organization, stack organization and addressing modes, Look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design.

UNIT II

Instruction types, formats, instruction cycles and sub cycles (fetch, execute etc), micro-operations, execution of a complete instruction, Hardwire and micro-programmed control: micro-programme sequencing, concept of horizontal and vertical microprogramming.

UNIT III

Basic concept and hierarchy, semiconductor RAM memories, 2D & $2\frac{1}{2}D$ memory organization. ROM memories, Cache memories: concept and design issues & performance, address mapping and replacement, Auxiliary memories: magnetic disk, magnetic tape and optical disks, Virtual memory: concept implementation.

UNIT IV

Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions, Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors, Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.

UNIT V

Architectural Classification Schemes, Flynn's & Feng's Classification, Performance Metrics and Measures, Speedup Performance Laws, Pipelining and Memory Hierarchy Basic and Intermediate Concepts, Linear and Nonlinear Pipeline Processors, Optimization of Cache Performance.

Reference Books:

1. Patterson, "Computer Organization and Design" Elsevier Pub. 2009
2. William Stalling, "Computer Organization", PHI
3. M. Morris Mano, "Computer System Architecture", Pearson Learning
4. Miles Murdocca, Vincent Heuring "Computer Architecture and Organisation: An Integrated Approch" 2nd Edition
5. Kai Hwang, "Advance Computer Architecture", TMH
6. Vravice, Hamacher & Zaky, "Computer Organization", TMH
7. John P Hays, "Computer Organization", McGraw Hill
8. Tannenbaum, "Structured Computer Organization", PHI
9. P Pal Chaudhry, "Computer Organization & Design" PHI
10. Dezso and Sima, "Advanced Computer Architecture", Pearson
11. Alan Clements "Computer Organization and Architecture" , Cengage Learning
12. Behrooz Parhami "Computer Architecture", Oxford

RCS305/ RCS405: DATA STRUCTURES

UNIT I

Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off.
Abstract Data Types (ADT), Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations.
Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.

UNIT II

Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.

UNIT III

Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.

UNIT IV

Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.

UNIT V

Searching: Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting.
Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees .
Hashing: Hash Function, Collision Resolution Strategies.
Storage Management: Garbage Collection and Compaction.

References:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein, “Data Structures Using C and C++”, PHI Learning Private Limited, Delhi India
2. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publications Pvt Ltd Delhi India.

3. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
4. Thareja, “Data Structure Using C” Oxford Higher Education.
5. AK Sharma, “Data Structure Using C”, Pearson Education India.
6. Rajesh K. Shukla, “Data Structure Using C and C++” Wiley Dreamtech Publication.
7. Michael T. Goodrich, Roberto Tamassia, David M. Mount “Data Structures and Algorithms in C++”, Wiley India.
8. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
9. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
10. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
11. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.
12. Adam Drozdek “Data Structures and Algorithm in Java”, Cengage Learning

RCS351: DISCRETE STRUCTURE & LOGIC LAB

Understanding of mathematical computation software such as Mapple, Prolog to experiment the followings:

1. Working of Computation software
2. Discover a closed formula for a given recursive sequence vice-versa
3. Recursion and Induction: Practice of proof techniques
4. Practice of various set operations
5. Testing of set operating using software
6. Counting
7. Combinatorial equivalence
8. Permutations and combinations
9. Difference between structures, permutations and sets
10. Implementation of a recursive counting technique
11. N digit binary sequences not having adjacent 1's
12. Probability simulation
13. The Birthday problem
14. Poker Hands problem
15. Baseball best-of-5 series: Experimental probabilities
16. Comparison of theoretical probability with experimental probability
17. Baseball: Binomial Probability
18. Basketball: One and one
19. Expected value problem
20. Binary relations

RCS352: COMPUTER ORGANIZATION LAB

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER and Implementing 4x1 and 8x1 MULTIPLEXERS.
4. Verify the excitation tables of various FLIP-FLOPS.
5. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
6. Design of an 8-bit ARITHMETIC LOGIC UNIT.
7. Design the data path of a computer from its register transfer language description.
8. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
9. Write an algorithm and program to perform matrix multiplication of two n * n matrices on the 2-D mesh SIMD model, Hypercube SIMD Model or multiprocessor system.
10. Study of Scalability for Single board Multi-board, multi-core, multiprocessor using Simulator.

RCS355/RCS455: DATA STRUCTURE USING C/ JAVA LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

REC405: INTRODUCTION TO MICROPROCESSOR

UNIT I
Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.

UNIT II
Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.

UNIT III
Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.

UNIT IV
Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.

UNIT V
8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller.
Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).

References:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill.
3. Yu-cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India.
4. Barry B. Brey, "The Intel Microprocessors, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium IV, Architecture, Programming & Interfacing", Eighth Edition, Pearson Prentice Hall, 2009.
5. Peter Abel, "IBM PC Assembly language and programming", Fifth Edition, Prentice Hall of India Pvt. Ltd.
6. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson education.

RCS401: OPERATING SYSTEMS

UNIT I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Re-entrant Kernels, Monolithic and Microkernel Systems.

UNIT II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer/ Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

UNIT III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

UNIT IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

UNIT V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Andrew S. Tanenbaum, "Modern Operating System", PHI Learning
3. Tanenbaum /Woodhaull "Operating System Design and Implementation", Pearson Publication.
4. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
5. Flynn, "Understanding Operating System" , Cengage.
6. D M Dhamdhere, "Operating Systems : A Concept basedApproach", McGraw Hill.
7. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education".
8. Stuart E. Madnick& John J. *Donovan.Operating Systems.*McGraw Hill.
9. A. K. Sharma, "Operating System", University Press.
10. Achyut S Godbole, Atul kahate , "Operating System", McGraw Hill

RCS402: SOFTWARE ENGINEERING

UNIT I

Introduction: Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

UNIT II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

UNIT III

Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

UNIT IV

Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

UNIT V

Software Maintenance and Software Project Management: Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Pankaj Jalote, Software Engineering, Wiley
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

5. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh, “Software Engineering”, Cengage Learning.
8. P fleeger, Software Engineering, Macmillan Publication

RCS403: THEORY OF AUTOMATA AND FORMAL LANGUAGES

UNIT I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem

UNIT II

Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT III

Context free grammar (CFG) and Context Free Languages (CFL): Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA.

UNIT V

Turing machines (TM): Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computerof Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
2. KLP Mishra and N. Chandrasekaran, "Theory of Computer Science: Automata, Languages and Computation", PHI Learning Private Limited, Delhi India.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishing house.
4. YN Singh "Mathematical Foundation of Computer Science", New Age International.
5. Malviya, AK "Theory of Computation and Application", BPaperback Publications
6. Papadimitrou, C. and Lewis, CL, "Elements of the Theory of Computation", Pearson Publication.

7. K. Krithivasan and R. Rama; Introduction to Formal Languages, Automata Theory and Computation; Pearson Education.
8. Harry R. Lewis and Christos H. Papadimitriou, Elements of the theory of Computation, Second Edition, Prentice-Hall of India Pvt. Ltd.
9. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Learning.
10. Katuri Viswanath, "Introduction to Mathematical Computer Science, An" Universities Press.

RCS451: OPERATING SYSTEMS LAB

1. To implement CPU Scheduling Algorithms
   - FCFS
   - SJF
   - SRTF
   - PRIORITY
   - ROUND ROBIN
2. Simulate all Page Replacement Algorithms
   - FIFO
   - LRU
3. Simulate Paging Technique of Memory Management

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS452: SOFTWARE ENGINEERING LAB

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java. (Model to code conversion)
10. Perform reverse engineering in java. (Code to Model conversion)
11. Draw the deployment diagram.

RCS453: TAFL Lab

Understanding of software like JFLAP for experimenting with formal languages

1. Deterministic Finite Automata (DFA)
2. Nondeterministic Finite Automata (NFA)
3. Conversion of NFA to DFA
4. DFA Minimization
5. DFA to regular grammar conversion
6. DFA to regular expression conversion
7. Combining automata
8. Regular expression to DFA conversion
9. Mealy and Moore machine
10. Pushdown automata
11. Single tape Turing machine
12. Multi-tape Turing machine
13. Context free grammars (CFG) with single symbols
14. CFG with multiple symbols
15. LL Parsing
16. LR Parsing
17. Regular expressions
18. Regular pumping lemma
19. Context free pumping lemma
20. CFG to Chomsky Normal form transformation

RCS454: PYTHON LANGUAGE PROGRAMMING LAB

Write a Python program to: -

1. Demonstrate the working of ‘id’ and ‘type’ functions
2. To find all prime numbers within a given range.
3. To print ‘n terms of Fibonacci series using iteration.
4. To demonstrate use of slicing in string
5.
    a. To add 'ing' at the end of a given string (length should be at least 3). If the given string already ends with 'ing' then add 'ly' instead. If the string length of the given string is less than 3, leave it unchanged.
    Sample String : 'abc'
    Expected Result : 'abcing'
    Sample String : 'string'
    Expected Result : 'stringly'
    b. To get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.
6.
    a. To compute the frequency of the words from the input. The output should output after sorting the key alphanumerically.
    b. Write a program that accepts a comma separated sequence of words as input and prints the words in a comma-separated sequence after sorting them alphabetically.
7. Write a program that accepts a sequence of whitespace separated words as input and prints the words after removing all duplicate words and sorting them alphanumerically.
8. To demonstrate use of list & related functions
9. To demonstrate use of Dictionary& related functions
10. To demonstrate use of tuple, set& related functions
11. To implement stack using list
12. To implement queue using list
13. To read and write from a file
14. To copy a file
15. To demonstrate working of classes and objects
16. To demonstrate class method & static method
17. To demonstrate constructors
18. To demonstrate inheritance
19. To demonstrate aggregation/composition
20. To create a small GUI application for insert, update and delete in a table using Oracle as backend and front end for creating form

The lab experiments for this course have to ensure that the following concepts of PYTHON LANGUAGE are covered during lab classes:

Installing Python; basic syntax, interactive shell, editing, saving, and running a script, the concept of data types; variables, assignments; immutable variables; numerical types; arithmetic operators and expressions; reading input from console, writing to console, comments in the program; understanding error messages; Conditions, Boolean logic, logical operators; ranges; Control statements: if-else, loops (for, while);

String manipulations: subscript operator, indexing, slicing a string; other functions on strings: string module, strings and number system, format functions: converting strings to numbers and vice versa. Binary, octal, hexadecimal numbers
Lists, tuples, sets, and dictionaries: basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries, Array in Python
Regular Expressions: re modules, match function, search function, modifiers and patterns
Design with functions: hiding redundancy, complexity; arguments and return values; formal vs actual arguments, named arguments. Program structure and design. Recursive functions, scope and global statements, Lambda expressions, Importing Modules, math Module & Random Modules, creating own module.
Exception Handling: Exceptions, except clause, try and finally clause user defined exceptions
File Handling: manipulating files and directories, os and sys modules; text files: reading/writing text and numbers from/to a file;
Simple Graphics: "turtle" module; simple 2d drawing - colors, shapes; digital images, image file formats. Graphical user interfaces: event-driven programming paradigm; tkinter module, creating simple GUI; buttons, labels, entry fields, dialogs; widget attributes - sizes, fonts, colors layouts, nested frames.
Database: cx_ Oracle module, Connections, Executing Queries, calling procedure and functions, Using GUI to access Database.
Object Oriented Programming: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in Python, classes, objects, attributes and methods; defining classes; design with classes, constructors and destructors, inheritance, polymorphism, operator overloading (_eq_, _str_, etc); abstract classes; aggregation and composition.

Reference books:

1. John M. Sewart, "Python for Scientist", Cambridge Universities Press.
2. Reema Thareja, "Python Programming" Oxford Higher Education.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python" Pearson
4. Mrak Litz, " Learning Python",O' Reilly
5. Mark Pilgrim, "Dive into Python", Apress
6. James L. Young, "Python made Simple and Practical", Kindle Edition (paperback)
7. Y. Daniel Liang "Introduction to Programming using Python" Pearson

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY LUCKNOW

Study & Evaluation Scheme with Syllabus for B.Tech. Second Year

Electronics Engineering / Electronics & Communication Engineering / Electronics & Telecommunication Engineering / Electronics & Instrumentation Engineering / Instrumentation & Control Engineering / Applied Electronics & Control Engineering / Biomedical Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2nd Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REE305	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
4.	REC301	Digital Logic Design	3-0-0	70	20	10	100	3
5.	REC302	Electronic Devices and Circuits	3-1-0	70	20	10	100	4
6.	REC303	Signals & Systems	3-0-0	70	20	10	100	3
7.	REC351	Digital Logic Design Lab	0-0-2	50	30	20	100	1
8.	REC352	Electronic Devices and Circuits Lab	0-0-2	50	30	20	100	1
9.	REC353	Signals & Systems Lab	0-0-2	50	30	20	100	1
10.	REC354	Electronics Workshop & PCB Design Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC401	Microprocessors & Microcontrollers	3-0-0	70	20	10	100	3
4.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
5.	REC403	Electronic Measurement & Instrumentation	3-0-0	70	20	10	100	3
6.	RCS406	Data Structure & Algorithms	3-0-0	70	20	10	100	3
7.	REC451	Microprocessors & Microcontrollers Lab	0-0-2	50	30	20	100	1
8.	REC452	Advanced Electronics System Lab	0-0-2	50	30	20	100	1
9.	REC453	Electronic Measurement & Instrumentation Lab	0-0-2	50	30	20	100	1
10.	RCS456	Data Structure & Algorithms Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

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b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REE305: NETWORK ANALYSIS & SYNTHESIS

UNIT I

Signal Analysis, Complex Frequency, General Characteristics and Descriptions of Signals, Node Voltage Analysis, Mesh Current Analysis, Step Function and Associated Wave Forms, The Unit Impulse, Initial and final conditions, Step and Impulse Response, Response of Source Free Circuits, Forced Response, Phasor and Steady State Responses of Circuits to Sinusoidal Functions, Resonance in AC Circuits.

UNIT II

Review of Laplace Transforms, Poles and Zeroes, Initial and Final Value theorems, The transform circuit, Superposition Theorem, Thevenin's and Norton's theorems, Maximum Power Transfer Theorem, Convolution Integral, Amplitude and phase responses. Network functions.

UNIT III

Graph Theory fundamentals, Matrix Representation of Graphs, Formulation of Network Response Equations using Incidence Matrix, Duality in Networks. Computation of Ladder and Non-Ladder Networks, Routh-Hurwitz Stability Criterion, Bode Diagrams.

UNIT IV

Parameters of Two Port Networks, Correlation between Two Port Parameters, Two Port, Relation between Port Parameters, Transfer Functions using Two Port Parameters, Interconnection of TwoPorts , Reciprocal and Symmetric Networks, Terminated Two Port Networks, Interconnections of Two Port Networks, Image Impedance, Iterative Impedance. Harmonics and Dirichlet`s Conditions, Waveform Symmetry and Fourier Coefficients. Filter Networks.

UNIT V

Active Network Synthesis and Realizability: Elements of Relizability Theory, Hurwitz Polynomial, Positive Real Functions (PRF), Characteristics of PRF, Methodology for Simple Network Synthesis, Synthesis of Two Element Type One Port Network.

Text Book:

1. Franklin F. Kuo, "Network Analysis and synthesis", Wiley India Pvt Ltd.
2. MS Sukhija, T.K. Nagsarkar, "Circuits and Networks", Oxford University Publication.

Reference Books:

1. ME Van Valkenberg, "Network Analysis", Prentice Hall of India Ltd.
2. Ghosh, "Network Theory: Analysis and Synthesis", PHI Learning Pvt. Ltd

REC301: DIGITAL LOGIC DESIGN

UNIT I

Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

UNIT II

Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III

Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

Synchronous & Asynchronous Sequential Circuits: Analysis of clocked sequential circuits with state machine designing, State reduction and assignments, Design procedure. Analysis procedure of Asynchronous sequential circuits, circuit with latches, design procedure, Reduction of state and flow table, Race-free state assignment, Hazards.

UNIT V

Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.

Reference Books:

1. DP Kothari and J.S. Dhillon, "Digital Circuits and Design", Pearson Education.
2. A. Anand Kumar, "Fundamentals of Digital Circuits", PHI Learning Pvt. Ltd.

REC302: ELECTRONIC DEVICES AND CIRCUITS

UNIT I

Energy Bands and Charge Carrier in Semiconductor: Bonding forces and energy bands in solids, Charge Carriers in Semiconductors, Carrier Concentrations, Drift Mechanism.
Excess carriers in Semiconductors: Optical Absorption, Carrier Lifetime: Direct Recombination, Steady State Carrier Generation, Quasi-Fermi Level, Diffusion of carriers and Einstein relation.

UNIT II

Junctions: Equilibrium Conditions, Forward and Reveres Biased Junctions; Steady State Conditions.
Optoelectronic Devices: Photodiode V-I characteristic, Photodetector, Solar Cells, Light Emitting Diode.

UNIT III

MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier

UNIT IV

BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

UNIT V

Feedback: The general feedback structure, properties of negative feedback, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt series feedback amplifier.
Oscillators: Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.

Text Book:

1. AS Sedra and K. C. Smith, “Microelectronic Circuits”, Oxford University Press.
2. Millman Jacob, Christos Halkias , Satyabrata Jit, “Electronic Devices and Circuits”, Tata McGraw Hill.
3. BG Streetman and S. Banerjee “Solid State Electronics Devices”, Prentice Hall of India.

Reference Books:

1. Donald A. Neamen “Semiconductor Physics & Devices”, Tata McGraw Hill.
2. Alok K. Dutta, “Semiconductor Devices and Circuits”, Oxford University Press.
3. Jacob Millman and Arvin Grabel, “Microelectronics”, Tata McGraw Hill.

REC303: SIGNALS & SYSTEMS

UNIT I

Signals: Representation of Signals, Singularity Functions, Discrete Time Signals, Types of Signals, Time Scaling and Shifting, Convolution and Correlation of LTI Systems, Correlation of energy and power signals.

UNIT II

Systems and Analysis of System: System Classification, Linearity/Time Invariance, Causal System, Characterization of LTI Systems, Unit Sample Response, Generalization of D.T. Systems, Concept of Stability, Convolution Integrals/summations, Energy and Power spectral density, Properties of Power spectral Density, Analysis of First order systems, Analysis of second order systems.

UNIT III

Fourier Transforms: Properties and Significance of CTFT, CTFT of Common Signals, Inverse CTFT; Introduction to DTFT, DTFT of Common Signals, Theorems and Properties – DTFT, Inverse DTFT; Continuous Time and Discrete Time Hilbert Transform and its Properties. Introduction of Gaussian signal and its Fourier transform.

UNIT IV

Laplace Transform and Z Transform: Laplace Transforms- Introduction, Laplace Transforms of common signals, Theorems and properties of Laplace Transforms, Concept of Region of Convergence, Inverse Laplace Transforms; Z Transforms – Introduction, Z Transforms of Common Signals, Theorems and properties of Z Transforms, Inverse Z Transforms.

UNIT V

Sampling of Time Signals: Nyquist Criterion, Sampling theorem and frequency domain representation of sampling, Sampling Techniques, Reconstruction of band limited signal from its samples, Sampling of Sinusoidal and other signals.

Text Book:

1. AV Oppenheim, A.S. Willsky and S. Hamid Nawab, ‘Signals and Systems’, Pearson Education.
2. TK Rawat, “Signals and Systems”, Oxford University Press.

Reference Books:

1. BP Lathi, “Principals of Linear Systems and Signals”, Oxford University Press.
2. P. Ramakrishna Rao, ‘Signal and System’, Tata McGraw Hill, New Delhi.
3. Kishore S. Trivedi, “Probability & Statistics with Reliability Queuing and Computer Science Applications”, Wiley Publication.

REC351: DIGITAL LOGIC DESIGN LAB

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

REC352: ELECTRONIC DEVICES AND CIRCUITS LAB

1. **Study of Lab Equipments and Components:** CRO, Multimeter, and Function Generator, Power supply- Active, Passive Components and Bread Board.
2. **P-N Junction diode:** Characteristics of PN Junction diode - Static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms}, V_{dc}, and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of zener diode, Graphical measurement of forward and reverse resistance..
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT:** BJT in CE configuration- Graphical measurement of h-parameters from input and output characteristics. Measurement of A_v, A_I, R_o and R_i of CE amplifier with potential divider biasing.
7. **Measurement of Operational Amplifier Parameters:** Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.
8. **Applications of Op-amp:** Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator.
9. **Field Effect Transistors:** Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Oscillators:** Sinusoidal Oscillators-
    a. Wein's bridge oscillator
    b. phase shift oscillator.
11. Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

REC353: SIGNALS & SYSTEMS LAB

1. Introduction to MATLAB
    a. To define and use variables and functions in MATLAB.
    b. To define and use Vectors and Matrices in MATLAB.
    c. To study various MATLAB arithmetic operators and mathematical functions.
    d. To create and use m-files.
2. Basic plotting of signals
    a. To study various MATLAB commands for creating two- and three-dimensional plots.
    b. Write a MATLAB program to plot the following Continuous time and discrete time signals
        1. Step Function
        2. Impulse Function
        3. Exponential Function
        4. Ramp Function
        5. Sine Function
3. Time and Amplitude transformations
    a. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
    a. Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
    a. Write a MATLAB program to compute autocorrelation of a sequence x(n) and verify the property.
    b. Write a MATLAB program to compute cross-correlation of sequences x(n) and y(n) and verify the property.
6. Fourier Series and Gibbs Phenomenon
    a. To calculate Fourier Series coefficients associated with Square Wave.
    b. To Sum the first 10 terms and plot the Fourier Series as a function of time
    c. To Sum the first 50 terms and plot the Fourier Series as a function of time
7. Calculating transforms using MATLAB
    a. Calculate and plot Fourier Transform of a given signal
    b. Calculate and plot Z-transform of a given signal
8. Impulse response and Step response of a given system
    a. Write a MATLAB program to find the impulse response and step response of a system form its difference equation
    b. Compute and plot the response of a given system to a given input
9. Pole-zero diagram and bode diagram
    a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function
    b. Write a MATLAB program to find, bode diagram of a given system from the given system function
10. Frequency response of a system
    a. Write a MATLAB program to plot magnitude and phase response of a given system
11. Checking Linearity/Non-Linearity of a system using SIMULINK
    a. Build a system that amplifies a sine wave by a factor of two.
    b. Test the linearity of this system using SIMULINK

References:

1. "Digital Signal Processing Using MATLAB" ,Vinay K. Ingle ,John G. Proakis, Cengage Learning
2. Mathworks Website www.mathworks.com/
3. Virtual Lab Website http://www.vlab.co.in/, http://iitg.vlab.co.in/?sub=59&brch=166

REC354: ELECTRONICS WORKSHOP & PCB DESIGN LAB

1. Study of CRO, DMM & Function Generator.
2. Study of various types of Active & Passive Components based on their ratings.
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. Identification of various types of Printed Circuit Boards (PCB) and soldering Techniques.
6. Introduction to PCB Design software
7. PCB Lab: a. Artwork & printing of a simple PCB.
   b. Etching & drilling of PCB.
8. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.

RCS406: DATA STRUCTURE & ALGORITHMS

UNIT I

Abstract Data Types, Sequences as value definitions, Data types in C, Pointers in C, Data Structures and C, Arrays in C, Array as ADT, One Dimensional Array, Implementing one Dimensional Array, Array as parameters, Two Dimensional Array, Structures in C, Implementing Structures, Unions in C, Implementation of unions, Structure Parameters, Allocation of storage and scope of variables, Recursive Definition and Processes: Factorial Function, Fibonacci Sequence, Recursion in C, efficiency of Recursion, Hashing: Hash Function, Open Hashing, Closed Hashing: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.

UNIT II

Stack, Queue And Linked List: Stack definition and examples, Primitive Operations, Example Representing Stacks in C, Push And Pop Operation Implementation, Queue as ADT, C Implementation of Queues, Insert Operation, Priority Queue, Array Implementation of Priority Queue, Inserting and Removing Nodes from a list-linked Implementation of stack, Queue and Priority Queue, Other List Structures, Circular Lists: Stack and Queue as Circular List -Primitive Operations on circular lists, Header Nodes, Doubly Linked Lists, Addition of Long Positive Integers on Circular and Doubly Linked List.

UNIT III

Trees: Binary trees: Operations on Binary Trees, Applications of Binary Trees, Binary Tree Representation, Node Representation of Binary Trees, Implicit Array Representation of Binary Tree, Binary Tree Traversal in C, Threaded Binary Tree, Representing List as Binary Tree, Finding the Kth element, Deleting an Element, Trees and their applications: C Representation of trees, Tree Traversals, Evaluating an Expression Tree, Constructing a Tree.

UNIT IV

Sorting And Searching: General Background of Sorting: Efficiency Considerations, Notations, Efficiency of Sorting, Exchange Sorts: Bubble Sort; Quick Sort; Selection Sort; Binary Tree Sort; Heap Sort, Heap as a Priority Queue, Sorting Using a Heap, Heap Sort Procedure, Insertion Sorts: Simple Insertion, Shell Sort, Address Calculation Sort, Merge Sort, Radix Sort, Sequential Search: Indexed Sequential Search, Binary Search, Interpolation Search.

UNIT V

Graphs: Application of Graph, C Representation of Graphs, Transitive Closure, Warshall's Algorithm, Shortest Path Algorithm, Linked Representation of Graphs, Dijkstra's Algorithm, Graph Traversal, Traversal Methods for Graphs, Spanning Forests, Undirected Graph and their Traversals, Depth First Traversal, Application of Depth First Traversal, Efficiency of Depth First Traversal, Breadth First Traversal, Minimum Spanning Tree, Kruskal's Algorithm, Round Robin Algorithm.

Text Book:

1. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, “Data structures using C and C++”, Pearson Education.
2. Reema Theraja, “Data Structure using C”, OUP Publication.

References Books:

1. E. Balagurusamy, “Programming in ANSI C', Second Edition, Tata McGraw Hill Publication.
2. Robert L. Kruse, Bruce P. Leung Clovis L. Tondo, “Data Structures and Program Design in C”, Pearson Education.
3. Lipschutz, “Data Structures With C”, Tata McGraw-Hill Education.
4. TH Koreman, “Introduction to Algorithms“, MIT Press.

REC401: MICROPROCESSORS & MICROCONTROLLERS

UNIT I

8085 MICROPROCESSOR: History and Evolution of Microprocessor and their Classification, Architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing modes, timing diagram of the instructions.

UNIT II

Hardware Interfacing with 8085: Methods of data Transfer and Interrupts of 8085 microprocessor: Classification of interrupts, Programming using interrupts, Direct Memory Access, Serial and parallel data transfer, Interfacing of Memory Chips with 8085 Microprocessor, Interfacing of 8085 with 8155/8156 (RAM), 8355/8755 (ROM). Interfacing of Programmable Devices with 8085 Microprocessor, 8279 programmable Keyboard/Display interface, 8255A programmable Parallel interface, 8254 programmable Interval Timer, 8259A programmable Interrupt Controller, Assembly language programming.

UNIT III

16-bit low power MCU MSP430: Introduction to microcontrollers and embedded systems, Von Neumann (Princeton) and Harvard architecture, RISC and CISC machine, Introduction to MSP430: Architecture, Programming Techniques, Addressing Modes, Programming System registers and configuration I/O ports pull up/down registers concepts, Low Power aspects of MSP430: low power modes, Active vs Standby current consumption.

UNIT IV

Configuring Peripherals in MSP430: External interrupts and software interrupt, interrupt programming, Watchdog timer, Clock Tree in MSP430, Timer/ counter interrupt, Programming MSP430 timer, counter programming, Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

UNIT V

Serial Communication Interfaces in MSP430: Basics of serial communication, mode of serial communication, RS232, serial communication issue, Serial port programming. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices, external memory, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor Interfacing and signal conditioning.
Case Study: MSP430 based embedded system application using the interface protocols for communication with external devices: “A Low-Power Battery less Wireless Temperature and Humidity Sensor with Passive Low Frequency RFID.

Text Book:

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram International Publication (India) Pvt. Ltd.
2. DV Hall, “Microprocessors Interfacing”, Tata McGraw Hill Publication.
3. N. Senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers”, Oxford University Press Publication.
4. Getting Started with the MSP430 Launchpad by Adrian Fernandez, Dung Dang, Newness publication ISBN-13: 978-0124115880

5. MSP430 microcontroller basics 1st Edition by John H. Davies (Author), Newnes Publication ISBN-13: 978-0750682763

Reference Books:

1. http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode
2. http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training
3. AK Roy & KM Bhurchandi, “Advance Microprocessor and Peripherals (Architecture, Programming & Interfacing)”, Tata McGraw Hill Publication.

REC402: ELECTROMAGNETIC FIELD THEORY

UNIT I

Coordinate Systems and Transformation :
Basics of Vectors: Addition, subtraction and multiplications**;** Cartesian, Cylindrical, Spherical transformation.
Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

UNIT II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses' Law- Maxwell's equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

UNIT III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

UNIT IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

UNIT V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form
Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book:

1. MNO Sadiku, "Elements of Electromagnetic', Oxford University Press.

Reference Books:

1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

REC403: ELECTRONIC MEASUREMENT AND INSTRUMENTATION

UNIT I

Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimensions and standards.
Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis.
PMMC instrument, Galvanometer, DC ammeter, DC voltmeter, series ohm meter.

UNIT II

Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes, Digital voltmeter systems, Digital multimeter, digital frequency meter System.

UNIT III

Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, Low Resistance Measuring Instruments, AC bridge theory, capacitance bridges, Inductance bridges, Q meter.

UNIT IV

CRO: CRT, Wave Form Display, Time Base, Dual Trace Oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications.

UNIT V

Instrument calibration: Comparison method, digital multimeter as standard instrument, calibration instrument, Recorders: X-Y recorders, plotters Transducers.

Text Book:

1. David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press.

Reference Books:

1. Oliver and Cage, "Electronic Measurements and Instrumentation", Tata McGraw Hill Publication.
2. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann).

REC451: MICROPROCESSORS AND MICROCONTROLLERS LAB

1. To study 8085 microprocessor system.
2. i) Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
   ii) Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
   iii) To perform multiplication and division of two 8 bit numbers using 8085.
3. Learn and understand how to configure MSP-EXP430G2 Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for MSP430 (blinking LEDs, push buttons interface).

   Exercises:

   a) Modify the delay with which the LED blinks.
   b) Modify the code to make the green LED blink.
   c) Modify the code to make the green and red LEDs blink:
      i. Together
      ii. Alternately

   d) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.

   e). Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.

   f). Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
4. Usage of Low Power Modes:

   Configure the MSP-EXP430G2 Launchpad for Low Power Mode (LPM3) and measure current consumption both in active and low power modes. Use MSPEXP430FR5969 as hardware platform and measure active mode and standby mode current.

   Exercises:

   a) How many Low power modes are supported by the MSP430G2553 platform?

   b) Measure the Active and Standby Current consumption in LPM3 mode for the same application using MSP430F5529 LaunchPad
5. Learn and understand GPIO based Interrupt programming. Write a C program and associated GPIO ISR using interrupt programming technique.

   Exercises:

   a) Write the code to enable a Timer interrupt for the pin P1.1.
   b) Write the code to turn on interrupts globally
6. Implement Pulse Width Modulation to control the brightness of the on-board, green LED. This experiment will help you to learn and understand the configuration of PWM and Timer peripherals of the MSP430G2553.

   Exercises:

   a) Observe the PWM waveform on a particular pin using CRO.
   b) What is the maximum resolution of PWM circuitry in MSP430G2 Launchpad?
   c) Change the above code to create a PWM signal of 75% duty cycle on particular PWM pin.
7. The main objective of this experiment is to control the on-board, red LED by the analog input from a potentiometer. This experiment will help you to learn and understand how to configure an ADC to interface with a potentiometer.

Exercises:

a) Alter the threshold to 75% of Vcc for the LED to turn on.

b) Modify the code to change the Reference Voltage from Vcc to 2.5V.

8. Learn and understand how to configure the PWM and ADC modules of the MSP-EXP430G2 Launchpad to control the DC motor using external analog input.

   Exercises:

   a) What is the maximum resolution of PWM circuitry in MSP430G2 LaunchPad and how it can be achieved using program?
   b) Create a PWM signal of 75% duty cycle on particular PWM pin.
   c) Create Switch case code from the example code to run the DC Motor in 3 set of speeds.

9. Understand the ULP Advisor capabilities and usage of ULP Advisor to create optimized, power-efficient applications on the MSP-EXP430G2 Launchpad.

   Exercises:

   a) How does the ULP Advisor software help in designing power-optimized code?
   b) Which ULP rule violation helps us to detect a loop counting violation?
   c) Connect the MSP430 to terminal on PC and echo back the data

10. Configure of Universal Serial Communication Interface (USCI) module of MSP430G2553 for UART based serial communication. The main objective of this experiment is to use UART of the MSP430G2553 to communicate with the computer.

    Exercise:

    Modify the above code to transmit the set of strings to the serial terminal via UART as shown below:

    char str1[]="MSP430G2 launchpad"

    char str2[]= "Ultra low power mixed signal processing applications"

11. Understand and Configure 2 MSP430F5529 Launchpads in master-slave communication mode for SPI protocol.

    Exercises:

    a) Which port pins of MSP430 can be configured for SPI communication?

    b) What is the data transfer rate supported by MSP430 for SPI communication?

REC452: ADVANCED ELECTRONICS SYSTEM LAB

Transistor Modeling and Circuits

- Metal Oxide Semiconductor Field Effect Transistors (MOSFETs)
    - *DC biasing of Common Source
    - *MOSFET Common Source Amplifier
    - *MOSFET Source Follower
    - *Current Mirror
- SPICE parameters for MOSFET transistors.
- Step-Down (Buck) DC-DC Converters.
- Step-Up (Boost) DC-DC Converter
- CMOS Amplifier design.

Timing

-MOSFET based Ring oscillators

-MOSFET based Relaxation oscillators

- MOSFET based Voltage-controlled oscillators
- Integration of crystal oscillator into circuits

Data Conversion

- Analog to Digital Conversion
    - * Successive Approximation ADC
- Digital to Analog Conversion
    - * Scaled Resistor Network

System Considerations

- System-level stability: decoupling, ground loops
- Basics of EMC and screening
- Examples of complete electronic systems

REC453: ELECTRONIC MEASUREMENT & INSTRUMENTATION LAB

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given scillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 transducer (ii) J- type transducer (iii) K-type transducer (iv) Pressure transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Figure)
7. Measurement of low resistance Kelvin's double bridge.
8. To measure unknown capacitance of small capacitors by using Schering's bridge.
9. To measure unknown Inductance using Hay's bridge.
10. To measure unknown frequency using Wein's frequency bridge.

RCS456: DATA STRUCTURE AND ALGORITHMS LAB

1. Run time analysis of Fibonacci Series
2. Study and Application of various data Structure
3. Study and Implementation of Array Based Program
   a. Searching (Linear Search, Binary Search)
   b. Sorting (Bubble, Insertion, Selection, Quick, Merge etc)
   c. Merging
4. Implementation of Link List
   a. Creation of Singly link list, Doubly Linked list
   b. Concatenation of Link list
   c. Insertion and Deletion of node in link list
   d. Splitting the link list into two link list
5. Implementation of STACK and QUEUE with the help of
   a. Array
   b. Link List
6. Implementation of Binary Tree, Binary Search Tree, Height Balance Tree
7. Write a program to simulate various traversing Technique
8. Representation and Implementation of Graph
   a. Depth First Search
   b. Breadth First Search
   c. Prim`s Algorithm
   d. Kruskal`s Algorithms
9. Implementation of Hash Table

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Study & Evaluation Scheme with Syllabus
for
B.Tech. Second Year

Electrical Engineering / Electrical & Electronics Engineering

On

Choice Based Credit System

(Effective from the Session: 2017-18)

2^{nd} Year III-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	ROE030 to 039/ RAS301	Science Based Open Elective/ Mathematics-III	3-1-0	70	20	10	100	4
2.	RVE301/ RAS302	Universal Human Values & Professional Ethics/ Environment & Ecology	3-0-0	70	20	10	100	3
3.	REC309	Analog & Digital Electronics	3-0-0	70	20	10	100	3
4.	REE301	Electrical & Electronics Engineering Materials	3-0-0	70	20	10	100	3
5.	REE302	Electrical Measurements & Instrumentation	3-0-0	70	20	10	100	3
6.	REE303	Basic Signals & Systems	3-1-0	70	20	10	100	4
7.	REE351	Electrical Workshop	0-0-2	50	30	20	100	1
8.	REE352	Electrical Measurements Lab	0-0-2	50	30	20	100	1
9.	REE353	Simulation Lab – I	0-0-2	50	30	20	100	1
10.	REC359	Electronics Lab	0-0-2	50	30	20	100	1
11.	RME101*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE151*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. II^{nd} year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

2nd Year IV-SEMESTER

S. No.	Subject Code	Subject Name	L-T-P	ESE Marks	Sessional		Total	Credit
					CT	TA		
1.	RAS401/ ROE040 to 049	Mathematics-III/ Science Based Open Elective	3-1-0	70	20	10	100	4
2.	RAS402/ RVE401	Environment & Ecology/ Universal Human Values & Professional Ethics	3-0-0	70	20	10	100	3
3.	REC402	Electromagnetic Field Theory	3-1-0	70	20	10	100	4
4.	REE401	Power Plant Engineering	3-0-0	70	20	10	100	3
5.	REE402	Electrical Machines -I	3-0-0	70	20	10	100	3
6.	REE405	Network Analysis and Synthesis	3-0-0	70	20	10	100	3
7.	REE451	Simulation– II Lab	0-0-2	50	30	20	100	1
8.	REE452	Electrical Machines -I Lab	0-0-2	50	30	20	100	1
9.	REE453	Networks Lab	0-0-2	50	30	20	100	1
10.	REE454	Electrical Instrumentation Lab	0-0-2	50	30	20	100	1
11.	RME201*	Elements of Mechanical Engineering*	3-1-0	70	20	10	100*	--
12.	RCE251*	Computer Aided Engineering Graphics*	0-0-3	50	30	20	100*	--
Total							1000	24

CT: Class Test **TA**: Teacher Assessment **L/T/P**: Lecture/ Tutorial/ Practical

***B.Tech. IInd year lateral entry students belonging to B.Sc. Stream, shall clear the subjects RCE151/RCE251 and RME101/201 of the first year Engineering Programme along with the second year subjects.**

Science Based Open Electives:

a. ROE030/ROE040 Manufacturing Process
b. ROE031/ROE041 Introduction to soft computing
c. ROE032/ROE042 Nano Science
d. ROE033/ROE043 Laser System and Application
e. ROE034/ROE044 Space Science
f. ROE035/ROE045 Polymer Science & Technology
g. ROE036/ROE046 Nuclear Science
h. ROE037/ROE047 Material Science
i. ROE038/ROE048 Discrete Mathematics
j. ROE039/ROE049 Applied Linear Algebra

REC309: ANALOG & DIGITAL ELECTRONICS

UNIT I

Special Diodes-LED, Photo diode, Schottky diode, Tunnel diode; their characteristics and applications.
Introduction to Power devices- Characteristics of SCR, TRIAC, DIAC.

UNIT II

Amplifier and Frequency Response-Introduction to Amplifier, Transfer Function, Frequency Response of Common Emitter, Multistage amplifier. Frequency response of Common source MOSFET Amplifier.

UNIT III

Feedback- General feedback structure; properties of negative feedback; series-series, series-shunt, shunt-series and shunt-shunt feedback amplifiers.
Oscillators-Basic principle of sinusoidal oscillator, R-C Phase Shift , Wein Bridge oscillators, tuned oscillators- Collpits and Hartley; Crystal oscillator, CLAP Oscillator.

UNIT IV

Number System, Gate Level Minimization (up to three Variables), SOP, POS Simplification.
Combinational Logic Circuits: Binary Adder/ Subtractor, Multiplexer/ Demultiplexer, Decoder/ Encoder
Sequential Logic: Introduction to latches, flip-flops- S-R, T, D, J-K.

UNIT V

Registers & Counter: Serial and parallel data transfer, shift left/right registers, universal shift register. Mode N Counters, ripple counters, synchronous counters, Ring/Johnson counters.
Memory: Introduction to ROM, RAM, PLA, PAL.

Text Books:

1. AS Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)
2. Malvino& Leach, “Digital Principles and applications” Tata Mc. Graw Hill
3. RA Gayakwad “Op amps and Linear Integrated Circuits” Prentice Hall of India.
4. Balbir Kumar and ShailB. Jain, “Electronic Devices and Circuits” Prentice Hall of India, 2007

Reference Books:

1. Taub & Schilling “Digital Electronics”- Tata McGraw Hill
2. Anil K. Maini, “Digital Electronics: Principles and Integrated circuits” Wiley India Ltd, 2008.
3. Millman, J. and Grabel A, “Microelectronics” McGraw Hill
4. Anand Kumar, “Switching Theory and Logic Design” Prentice Hall of India, 2008.
5. Aloke. K. Dutta, “Semiconductor Devices and circuits”, Oxford University Press, 2008.

REE301: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

UNIT I

Dielectric Materials: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT II

Magnetic Materials: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and hysteresis.

UNIT III

Semiconductor Materials: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI).

UNIT IV

Materials For Electrical Applications: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation.

UNIT V

Special Purpose Materials: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI Reading.

Text Books:

1. RK Rajput, A course in Electrical Engineering Materials, Laxmi Publications, 2009
2. TK Basak, A course in Electrical Engineering Materials, New Age Science Publications, 2009
3. Adrianus J. Dekker, Electrical Engineering Materials, Pearson, 2016.

Reference Books:

1. TTTI Madras, Electrical Engineering Materials
2. C S Indulkar & S Thiruvengadam, Electrical Engineering Materials

REE302: ELECTRICAL MEASUREMENTS & INSTRUMENTATION

UNIT I

Electrical Measurements: Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Review of indicating and integrating instruments: Voltmeter, Ammeter, Three phase Wattmeter, Multimeter and Energy meter.

UNIT II

Measurement of Resistance, Inductance and Capacitance: Measurement of low, medium and high resistances, insulation resistance measurement, AC bridges for inductance and capacitance measurement.

UNIT III

Instrument Transformers: Current and Potential transformer, ratio and phase angle errors, design considerations and testing.

UNIT IV

Electronic Measurements: Electronic voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Spectrum & Wave analyzer. Digital counter, frequency meter, voltmeter, multimeter and storage oscilloscope.

UNIT V

Instrumentation: Transducers, classification & selection of transducers, strain gauges, Thermistors, Thermocouples, LVDT, Inductive & capacitive transducers, Piezoelectric and Hall-effect transducers, Measurement of motion, force, pressure, temperature, flow and liquid level, basic concepts of smart sensors and application. Data Acquisition Systems.

Text Book:

1. A K Sawhney, “Electrical & Electronic Measurement & Instrument”, Dhanpat Rai & Sons, India
2. BC Nakra & K. Chaudhary, “Instrumentation, Measurement and Analysis,” Tata McGraw Hill 2nd Edition
3. Purkait, “Electrical & Electronics Measurement & Instrumentation”, TMH

Reference Books:

1. Forest K. Harris, “Electrical Measurement”, Willey Eastern Pvt. Ltd. India
2. M. Stout , “Basic Electrical Measurement”, Prentice Hall of India
3. WD Cooper, “Electronic Instrument & Measurement Technique”, Prentice Hall International
4. EW Golding & F.C. Widdis, “Electrical Measurement &Measuring Instrument”, AW Wheeler & Co. Pvt. Ltd. India

REE303: BASIC SIGNALS & SYSTEMS

UNIT I

Introduction To Continuous Time Signals And Systems: Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties.

Analogous System: Linear mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

UNIT II

Fourier Transform Analysis: Exponential form and Compact trigonometric form of Fourier series, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.

UNIT-III

Laplace Transform Analysis: Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms.

UNIT IV

State – Variable analysis: Introduction, State Space representation of linear systems, Transfer function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State – Variable technique to the analysis of linear systems.

UNIT-V

Z – Transform Analysis: Concept of Z – Transform, Z – Transform of common functions, Inverse Z – Transform, Initial & Final value Theorems, Applications to solution of difference equations, Properties of Z-transform.

Text Books:

1. Oppenhiem, Wilsky, Nawab, “Signals & Systems”, PHI
2. Anand Kumar, “ Signals & Systems”, PHI
3. Choudhary D. Roy, “Network & Systems”, Wiley Eastern Ltd.

Reference Books:

1. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
2. Donald E. Scott, “Introduction to circuit Analysis” Mc. Graw Hill
3. BP Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
4. IJ Nagrath, S.N. Saran, R. Ranjan and S. Kumar, “Signals and Systems”, Tata Mc.Graw Hill, 2001.
5. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India

REE351: ELECTRICAL WORKSHOP

Note: Minimum ten experiments are to be performed from the following list:

1. To study the working and Control of two lamps in series and in parallel
2. To perform the stair case working and it's testing.
3. To study the working principle and wiring of fluorescent lamp.
4. To study and wiring of distribution board including power plug using isolator, MCB, ELCB.
5. To study and estimate a typical, BHK house wiring.
6. Familiarization, soldering, testing and observing the wave forms on CRO of a HW and FW uncontrolled rectifier (using diodes) with capacitor filter.
7. Visit your college substation and familiarize the supply system, Transformer, HT Panel and Distribution etc.
8. To study construction, working and application of workshop tools. Also study the Electrical and Electronics Symbols.
9. To study the wires, cables and their gauges, Domestic Electrical Accessories.
10. Mini Project on PCB.
11. To study fault, Remedies in Domestic Installation and Indian Electricity Rules.
12. To study the different types of earthing system and measure the earth resistance.

REE352: ELECTRICAL MEASUREMENTS LAB

Note: Minimum ten experiments are to be performed from the following list:

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance by Maxwell's Bridge.
3. Measurement of inductance by Hay's Bridge.
4. Measurement of inductance by Anderson's Bridge.
5. Measurement of capacitance by Owen's Bridge.
6. Measurement of capacitance by De Sauty Bridge.
7. Measurement of capacitance by Schering Bridge.
8. Measurement of low resistance by using Kevin's Double bridge.
9. Measurement of phase difference and frequency of AC signal using CRO.
10. Measurement of Power using CT & PT.
11. Measurement of iron loss in a ring by using Maxwell's Bridge.
12. To measure high resistance by using loss of charge method.

REE353: SIMULATION LAB - I

Note: Minimum ten experiments are to be performed from the following list:

1. Introduction to MATLAB and its basic commands
2. Determine the root of a polynomial
3. Determination of polynomial using method for least square curve fitting
4. Solution of differential equation using 4th order runge - kutta method
5. Determination of time response of an RLC circuit
6. Single line Modeling of DC motor
7. Step, Ramp and impulse response of transfer function
8. Generation of single and three phase sinusoidal waveform
9. PWM based waveform generation
10. Single phase uncontrolled half wave rectifier using R and RL load
11. Single phase uncontrolled full wave rectifier using R and RL load
12. Three phase uncontrolled full wave rectifier using R and RL load

Institute may add any two software based experiments [Develop Computer Program in ‘C’ language or use MATLAB or Electrical Domain Simulation Software: “Virtual HIL Device” (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REC359: ELECTRONICS LAB

ANALOG ELECTRONICS:

Note: Select at least any five out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any five out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and mono-stable multi vibrators.
11. To study operation IC 555 based astable and mono-stable multi vibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

REE401: POWER PLANT ENGINEERING

UNIT I
Hydro-electric power plants – selection of site, elements of power plant, classification, water turbines, governor action, hydro-electric generator, plant layout, pumped storage plants.

UNIT II
Thermal Steam power plants – selection of site, elements and operational circuits of the power plant, turbo-alternators, plant layout, steam turbines, controls and auxiliaries.

UNIT III
Nuclear power plants – selection of site, nuclear reaction – fission process and chain reaction, constituents of power plant and layout, nuclear reactor – working, classification, control, shielding and waste disposal.

UNIT IV
Renewable power plants – Solar power generation – Photo-voltaic and solar thermal generation – solar concentrators, Wind power generation – types of wind mills, wind generators, tidal, biomass, geothermal and magneto-hydro dynamic power generation, micro-hydel power plants, fuel cells and diesel and gas power plants.

UNIT V
Combined operation of power plants – plant selection, choice of size and number of generator units, interconnected systems, real and reactive power exchange among interconnected systems. Power plant economics: load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants, Economic Load Sharing.

Text Books:
1. Chakrabarti A., Soni M.L., Gupta P.V., and Bhatnagar U.S., 'A text book on Power Systems Engg.', DhanpatRai and Sons, New Delhi, 2nd revised edition, 2010.
2. JB Gupta, ‘A course in Power Systems’, S.K. Kataria and sons, reprint 2010-2011.

Reference Books:
1. Wadhwa, C.L., ‘Generation Distribution and Utilization of Electrical Energy', New Age International publishers, 3rd edition, 2010.
2. Deshpande M.V, `Elements of Electrical Power systems Design’, Pitman, New Delhi, PHI Learning Private Limited, 1st edition, 2009**.**

REE402: ELECTRICAL MACHINES - I

UNIT I

Principles of Electro-mechanical Energy Conversion: Introduction, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy, concept of Doubly excited system, Generation of EMF in Machines, Torque in machine with cylindrical air gap.

UNIT II

DC Machines: Construction, Classification and circuit model of DC Machines, Armature winding (Concentrated and Distributed), Winding Factor, EMF and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators, Series and Parallel operation of the DC Generator, Applications.

UNIT III

DC Machines (Contd.): Performance characteristics of DC motors, Starting of DC motors; 3 point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Leonard method); Efficiency and Testing of DC machines (Hopkinson's and Swinburne's Test), Applications.

UNIT IV

Single Phase Transformer: Construction, EMF Equation, Equivalent Circuit, Phasor diagram, Efficiency and voltage regulation, All day efficiency.
Testing of Transformers- O.C. and S.C. tests, Polarity test, Sumpner's test,
Auto Transformer- Single phase and three phase autotransformers, Volt-amp relation
Copper saving in autotransformer Efficiency, Merits & demerits and applications.

UNIT V

Three Phase Transformers: Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Three winding transformers, Excitation phenomenon and harmonics in transformers.

Text Books:

1. IJ Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad , "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher
4. AE Fitggerald, C. Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

1. H. Cotton, "Electrical Technology", CBS Publication.
2. MG Say, "The Performance and Design of AC machines", Pit man& Sons.
3. PS Bimbhra, " Generalized Theory.

REE405: NETWORK ANALYSIS AND SYNTHESIS

Unit I

Graph Theory: Importance of Graph Theory in Network Analysis**,** Graph of a network, Definitions, planar & Non Planar Graphs, Isomorphism, Tree, Co Tree, Link, basic loop and basic cutset, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis.

Unit II

Network Theorems (Applications to dependent & independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's Theorem.

Unit III

Transient Circuit Analysis: Natural response and forced response, Transient response andsteady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit IV

Network Functions: Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.

Two Port Networks- Characterization of LTI two port networks; Z, Y,ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation, terminated two Port networks, Image Impedance.

Unit V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RCand RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters.

Text Books:

1. ME Van Valkenburg, "Network Analysis", Prentice Hall of India.
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill.
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. CL Wadhwa, "Network Analysis and Synthesis", New Age International Publishers.
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill.
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill.
3. ME Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T.S.K.V. Iyer, "Circuit Theory", Tata McGraw Hill.
5. Samarjit Ghosh, " Network Theory: Analysis & Synthesis" Prentice Hall India.

REE451: SIMULATION-II LAB

Note: Minimum ten experiments are to be performed from the following list

1. Design of three phase inverter using R and RL Load
2. Design of DC to DC converter using R and RL Load
3. Simulate the response of DC machine using three phase rectifier
4. Simulate the response of DC machine using PID controller
5. Simulate the response of Induction machine using three phase inverter
6. Simulate the response of synchronous machine using three phase inverter
7. Introduction to fuzzy system toolbox
8. Speed control of DC machine using fuzzy system
9. Introduction to neural network toolbox
10. Load forecasting of power system using neural network
11. Introduction to Genetic Algorithm
12. Least square curve fitting using Genetic Algorithm

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE452: ELECTRICAL MACHINES-I LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a DC shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed-torque characteristics of a DC shunt motor.
6. To obtain speed control of DC shunt motor using (a) armature resistance control (b) field control
7. To obtain speed control of DC separately excited motor using Ward-Leonard.
8. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.
12. To demonstrate the parallel operation of three phase Transformer and to obtain the load sharing at a particular load.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE453: NETWORKS LAB

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. Verification of principle of superposition with AC sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in AC circuits.
3. Verification of Tellegen's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for
6. under damped, critically damped and over damped cases.
7. Determination of frequency response of current in RLC circuit with sinusoidal AC input.
8. Determination of z and h parameters (DC only) for a network and computation of Y and ABCD Parameters.
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
10. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
11. Verification of parameter properties in inter-connected two port networks: series, parallel
12. and cascade. Also study loading effect in cascade.
13. Determination of frequency response of a Twin – T notch filter.
14. To determine attenuation characteristics of a low pass / high pass active filters.

Institute may add any two software based experiments [Develop Computer Program in 'C' language or use MATLAB or Electrical Domain Simulation Software: "Virtual HIL Device" (Free, Unlimited Users, Full Version) from Typhoon HIL GmbH or Equivalent software] in the above list.

REE454: ELECTRICAL INSTRUMENTATION LAB

Note: Minimum ten experiments are to be performed from the following list

1. Measurement of displacement using LVDT.
2. Measurement of load using strain gauge based load cell.
3. Measurement of water level using strain gauge based water level transducer
4. Measurement of temperature by RTD.
5. Design and Test a signal conditioning circuit for any transducer.
6. Simulate and analyze the frequency domain measurement of electrical signals using spectrum analyzer.
7. Study of PID controllers in flow measurement.
8. Measurement of flow rate by anemometer.
9. Measurement of solar energy using sensor.
10. Implementation of Color Sensor for differentiating frequencies.
11. Determine rotational speed and angle of a motor shaft using Encoder.
12. Range finding and object detection using detection sensor.
13. Measurement using various sensors and analyzing the output using Lab-VIEW software.
14. Design a circuit for noise reduction in measurement system.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

LUCKNOW

Evaluation Scheme & Syllabus

For

MBA Second Year

AS PER AICTE MODEL CURRICULUM

(Effective from the Session: 2019-20)

MBA Scheme of Teaching & Evaluation for Session 2019-20

SEMESTER III												
S. No.	**Code**	**Course Title**	**Periods**			**Evaluation Scheme**						**Credit**
						Sessional Exams					**Total**	
			L	**T**	**P**	**CT**	**TA**	**Total**	**ESE**			
1	KMB301	Strategic Management	4	0	0	30	20	50	100	150		3
2	KMB302	International Business Management	4	0	0	30	20	50	100	150		3
3		Specialization Group -1 Elective 1*	4	0	0	30	20	50	100	150		3
4		Specialization Group -1 Elective 2*	4	0	0	30	20	50	100	150		3
5		Specialization Group -1 Elective 3*	4	0	0	30	20	50	100	150		3
6		Specialization Group -2 Elective 1*	4	0	0	30	20	50	100	150		3
7		Specialization Group -2 Elective 2*	4	0	0	30	20	50	100	150		3
8	KMB303	Summer Training Project Report & Viva Voce	2	0	0	0	0	50	100	150		3
		TOTAL							**800**	**1200**		**24**

SEMESTER IV											
S. No.	Code	Course Title	Evaluation Scheme								Credit
			Sessional Exams								
			L	T	P	CT	TA	Total	ESE	Total	
1	KMB401	Project Management	4	0	0	30	20	50	100	150	3
2	KMB402	Entrepreneurship Development	4	0	0	30	20	50	100	150	3
3	RVE401	Universal Human Values and Professional Ethics	4	0	0	30	20	50	100	150	3
4		Specialization Group -1 Elective 4*	4	0	0	30	20	50	100	150	3
5		Specialization Group -1 Elective 5*	4	0	0	30	20	50	100	150	3
6		Specialization Group -2 Elective 3*	4	0	0	30	20	50	100	150	3
7	KMB405	Research Project Report and Viva Voce	4	0	0	0	0	100	200	300	6
		TOTAL							**800**	**1200**	**24**

Specialization Group: Human Resource

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBHR01	Talent Management
2	KMBHR02	Performance and Reward Management
3	KMBHR03	Employee Relations and Labour Laws

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBHR04	Strategic Human Resource Management
2	KMBHR05	International Human Resource Management

Specialization Group: Marketing

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBMK01	Sales & Retail Management
2	KMBMK02	Consumer Behaviour& Marketing Communications
3	KMBMK03	Digital & Social Media Marketing

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBMK04	Marketing of Services
2	KMBMK05	Marketing Analytics

Specialization Group: Finance

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBFM01	Investment Analysis & Portfolio Management
2	KMBFM02	Tax Planning and Management
3	KMBFM03	Financial Market & Services

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBFM04	Working Capital Management
2	KMBFM05	Financial Derivatives

Specialization Group: International Business

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBIB01	International Marketing
2	KMBIB02	International Logistics
3	KMBIB03	Export Import Documentation

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBIB04	International Trade Laws
2	KMBIB05	Cross Cultural Management

Specialization Group: Information Technology

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBIT01	Enterprise Resource Planning
2	KMBIT02	Web Technology & E- Commerce

3	KMBIT03	Cloud Computing for Business

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBIT04	Database Management System
2	KMBIT05	System Analysis & Design

Specialization Group: Operations Management

Elective Papers in III Semester

S. No	Code	Course Title
1	KMBOM01	Supply Chain & Logistics Management
2	KMBOM02	Operations Planning and Control
3	KMBOM03	Quality Toolkit For Managers

Elective Papers in IV Semester

S. No	Code	Course Title
1	KMBOM04	Sourcing Management
2	KMBOM05	Management of Manufacturing System

Strategic Management

Code: KMB301 **Credits: 3** **Teaching Hours: 36**

Course Objectives

1. A clear understanding of the key concepts and principles of strategic management
2. A set of useful analytical skills, tools and techniques for analyzing a company strategically
3. To provide a basic understanding of the nature and dynamics of the strategy formulation and implementation processes.
4. To encourage students to think critically and strategically.
5. The ability to identify strategic issues and design appropriate courses of action.

UNIT 1 **(6 Hours)**

Introduction: meaning nature, scope, and importance of strategy; and strategic Smanagement, Introduction to Business policy, Strategic decision-making , Process of strategic management and levels at which strategy operates , strategic intent: Vision, Mission, Business definition, Goals and Objectives

UNIT 2 **(8 hours)**

Environmental Scanning : Factors considered, approaches, External environmentanalysis: PESTEL Analysis, EFE matrix (External Factor Evaluation): Porter's Five Forces Model methods and techniques used , Internal Appraisal – The internal environment, Organizational Capability Factors, organizational appraisal- factors affecting, approaches, methods & techniques Resource Based View (RBW) Analysis, VRIO Framework, Value Chain Analysis, IFE matrix (Internal Factor Evaluation).

UNIT 3 **(8 hours)**

Strategy Formulation: Corporate, Business, Functional strategy**,** Concentration Strategies, Integration Strategies: Horizontal & Vertical, Diversification: Related & Unrelated, Internationalization , Porters Model of competitive advantage of nations, Cooperative: Mergers & acquisition Strategies, Joint Venture, Strategic Alliance , Digitalization Strategies .

Unit 4 **(8 hours)**

Strategy Analysis : Process, Analysing Strategic alternative, Evaluating and choosing among Strategic Alternative, Tools & Techniques of strategic Analysis, Strategic Choice. BCG Matrix, Ansoff Grid, GE Nine Cell Planning Grid, McKinsey's 7'S framework

Strategy implementation: Resource allocation, Projects and Procedural issues. Organization structure and systems in strategy implementation. Leadership and corporate culture, Values, Ethics and Social responsibility. Operational and derived functional plans to implement strategy. Integration of functional plans.

Unit 5 **(6 hours)**

Strategy Evaluation &Control : Nature, Importance, Organistional systems and Techniques of strategic evaluation & control.

Course Outcome

After successful completion of this course students will be able to

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Formulate organizational vision, mission, goals, and values.	Apply (K3)
2	**CO2.** Develop strategies and action plans to achieve an organization's vision, mission, and goals.	Create (K6)

3	**CO3.** Develop powers of managerial judgment, how to assess business risk, and improve ability to make sound decisions and achieve effective outcomes.	Create (K6)
4	**CO4.** Evaluate and revise programs and procedures in order to achieve organizational goals;	Evaluate (K5)
5	**CO5.** Consider the ethical dimensions of the strategic management process;	Analyse (K4)

Suggested Readings

1. Henry, A :Understanding Strategic Management, OUP
2. Stewart Clegg, Chris Carter, Martin Kornberger & Jochen Schweitzer : Strategy - Theory and Practice (Sage Publication, South Asia Edition)
3. Kazmi, Azhar; Business Policy and Strategic Management; McGraw-Hill Education. Fourth edition.
4. David, Fred; Strategic Management: Concepts and Cases; PHI Learning. Fifteenth edition.
5. Thomson, Arthur A. and Strickland, A. J.; Strategic Management: Concept and Cases; McGraw Hill Education, Eleventh edition.
6. Jauch, L.F., and Glueck, W.F.; Business Policy and Strategic Management; McGraw-Hill Education, Fifth edition.
7. Wheelen, L. Thomas and Hunger, David J.; Strategic Management and Business Policy, Crafting and Executing Strategy; Pearson Education, Thirteenth edition.

Skills	**Measuring tool**
Ability to scan business environment	Assignments + Case study + Workshop
Ability to draft strategic intent.	Case study + Workshop
Ability to formulate strategy and its Implementation	Assignments + Case study + Workshop

INTERNATIONAL BUSINESS MANAGEMENT

Code: KMB302 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Course Objectives

1. To give the student an exposure to the dynamic environment of International Business
2. To understand the impact of environment on the International Business Operations of the firm
3. To explain the functions and form of the global monetary system
4. To explain the role of International organizations and Regional Trade

Unit I **(8 hours)**

Introduction: Meaning, Nature and Scope of International Management, Driving and Restraining Forces, Domestic to Transnational Business, Modes of Entry. Globalization – Forces, Meaning, dimensions and stages in Globalization, Characteristics and role of MNCs. International Business Environment – The economic environment; social and cultural environment, political, legal and regulatory environment, natural environment, technological environment.

Unit 2 **(8 hours)**

International Trade Theories: Mercantilism; Absolute Cost theory, Comparative Cost theory, Factor endowment theory, International Product life Cycles Theory, International Investment Theories: Theory of Capital Movements, Market Imperfections theory; Internationalization Theory; Location Specific Advantage Theory; Eclectic Theory Free Trade: Advantages and Disadvantages, Forms of Protection: Tariffs, Subsidies, Import Quotas, Voluntary Export Restraints, Administrative Policy, Anti-dumping Policy

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Unit 3 **(8 hours)**

International Marketing: Nature & significance, International Marketing Orientations, International Segmentation, International Product Life Cycle International HRM: International Staffing Approaches, Expatriate Management, International Labor Relations.

Unit 4 **(6 hours)**

Foreign Exchange Determination Systems: Basic Concepts Relating to Foreign Exchange, Various types of Exchange Rate Regimes, Factors Affecting Exchange Rates, Brief History of Indian Rupee

Unit 5 **(6 hours)**

International Institutions: Objectives and Functions of WTO, IMF, IBRD, UNCTAD, Regional Economic Integration: Introduction, Levels of Economic Integration, Objectives and Functions of EU, NAFTA, ASEAN, SAARC, BRICS

SUGGESTED READINGS

1.Joshi, R M : International Business, OUP
2. Hill - International Business, McGraw-Hill2.Cherunilam F- International Business: Text and Cases, PHI

Reference Books1.Aswathappa- International Business, McGraw-Hill
3. Cherunilam, F - International Trade and Export Management, Himalaya
4.Daniels - International Business (Pearson)4.Albaum Duerr - International Marketing and Export management (Pearson, 7th Ed.)

Websites: www.ibef.orgwww.cia.gov.inCourse

Course Outcomes(CO)	**Bloom's Taxonomy**
CO 1: To get an overview of the key issues and concepts of International Business.	Knowledge (K2) Comprehending (K3)
CO 2: Understand how and why the world's countries differ.	Comprehending (K 3)
CO 3: Understand the monetary framework in which international business transactions are conducted .	Comprehending (K 3) Knowledge (K 2)
CO 4: Understand the role of International Organizations and Regional Trade blocks	Knowledge (K 2) Evaluating (K7)
CO 5: Implement the decisions for international operations in a superior manner	Evaluating (K7) Applying (K 4)

Skills	**Measuring tool**
Understanding of principles of International Business Group assignment.	Case study analysis
Develop reasoning abilities for applying the theoretical Knowledge	Group assignment Case study analysis
Understanding of fundamentals of International Marketing, Finance & HRM	Group project Presentations
Critical thinking skills for understanding the role of International organizations and Regional Trade Blocks	Quiz, Debate, Case study analysis

Semester IV

PROJECT MANAGEMENT

Code: KMB401 **Credits: 3** **Teaching Hours: 36**

Course Objective: The course is intended to develop the knowledge of the students in the management of projects, special emphasis will be provided on the managerial aspects of project management along with understanding of various tools and techniques for project appraisal and control. It will help the MBA students to draft the project proposal in any area of management and evaluate the worth of projects.

Unit 1(6 Sessions)
Introduction of Project: Definitions & Characteristics of Project, Types of Projects, Project Life Cycle. Concepts of Deliverables, Scope of Work and Milestones. **Project Management Process:** Introduction, Tools & Techniques of Project Management. **Project Teamand Scope of Project Management:** Characteristics of a Project Team & Project Leader, Project Organization, and Importance of Project Management. Case Studies

Unit II(08 Sessions)
Project Identification & Selection: Identification, Generation of ideas, Approaches to Project Screening and Selection, Project Rating Index. **Market & Demand Analysis Techniques**: Survey & Trend Projection Methods. **Project Risk Management:** Concepts and Types of Project Risks, Risk Identification, Risks Analysis, Risks Mitigation Strategies. **Case Studies**

Unit III (08 Sessions)
Project Costing: Fundamental components of Project Cost, Types of Costs: Direct, Indirect, Recurring, Non-Recurring, Fixed, Variable, Normal, Expedite costs. **Project Financing and Budgeting**: Sources of Finance, Top down Budgeting, Bottom up Budgeting, Activity Based Costing. **Social Cost Benefit Analysis (SCBA) of Project**: Concept & significance of SCBA, Approaches to SCBA. **Case Studies**

Unit IV (08 Sessions)
Project Scheduling and
Network Analysis: Steps in Project Scheduling and Network design, Gantt Chart, Work Breakdown Structure (WBS) & Responsibility Assignment Matrix. **Project Network Design**: Identifying the Nodes and Activities, Activity on Arrow (AoA) and Activities on Node (AoN) methods, Introduction to PERT and CPM, Crashing in Projects. **Case Studies**

Unit V (10 Sessions)
Project Monitoring and Control: Planning- Monitoring and Control Cycle. Project Management Information System. Milestone Analysis and Tracking Gantt chart.

Earned Value Analysis (EVA): Planned Value (PV), Earned Value (EV), Cost Variance (CV), Schedule Variance (SV), Cost performance Index (CPI), Schedule performance Index (SPI). **Project Termination:** Types of Terminations, Project Termination Process. **Case Studies**

Course Outcomes(CO)	**Bloom's Taxonomy**
CO 1: Students will be able to understand the characteristics of Project and Project Management	Knowledge (K 2) Remembering (k1) Comprehending (K 3)
CO 2: The students will understand the managerial process along with tools & techniques used in Project management	Knowledge (K 2) Applying (K 4) Synthesizing (K6) Evaluating (K7)
CO 3: Students will understand the scheduling and monitoring process in Project. They will be able to apply PERT and CPM method for project scheduling	Comprehending (K 3) Applying (K 4) Analyzing (K 5) Evaluating (K7)
CO 4: Students will understand the perspectives in which optimum decisions are to be taken in case of risks with planned activities in project.	Applying (K 4) Analyzing (K 5) Evaluating (K7)

SUGGESTED READINGS

Project Management – Achieving Competitive Advantage: Jeffrey K. Pinto (Pearson)

1. Project Management- A Managerial Approach: Jack R. Meredith Broyhill Samuel J. Mantel, Jr (John Wiley & Sons)
2. Project Management : MrSanjivMarwah- (Wiley Dreamtech)
3. Project- Preparation, Appraisal, Budgeting and Implementation: Chandra Prasanna - (TMH)
4. Project Management Core Text Book : M R Gopalan (Wiley)
5. Quantitative Techniques in Management : N D Vohra (TMH)

Skills	**Measuring tool**
Application of various Project Techniques	Exercise and workshop
Ability to visualize the best projects among alternatives	Assignments + Case study + Workshop
Monitoring and controlling of Project cost.	Live Training

ENTREPRENEURSHIP DEVELOPMENT

Code: KMB402 Credits: 3 Teaching Hours: 36

COURSE OBJECTIVES

- The purpose of this course is to expose the student to the basic concepts of entrepreneurship and Common myths to becoming an entrepreneur. Students will be exposed to the functions of entrepreneurs, and problems faced by them in the real world.
- To impart understanding of Entrepreneurial Finance, Assistance and role of entrepreneurial development agencies
- To provide insights to students in converting an Idea to an opportunity and develop understanding of various funding sources for a startup.
- Familiarizing the students on Developing a Business Plan and to provide basic understanding of Launching a New Venture

Unit 1

Introduction: Meaning, definition and concept of entrepreneur, entrepreneurship and entrepreneurship development. The entrepreneurial mind-set. Common myths to becoming an entrepreneur and how to overcome them. Corporate entrepreneurship. Concepts of intrapreneurship, types of entrepreneurs, functions of entrepreneur. Family Business, Women entrepreneurship, social and rural entrepreneurship.

Unit 2

Entrepreneurial Finance, Assistance and Entrepreneurial Development Agencies: Estimating financial funds requirement; Sources of finance – banks, various financial institutions (including IFCI, ICICI, IDBI and SIDBI), financing of small scale industries in developing countries.

Role of central government and state government in promoting entrepreneurship with various incentives, subsidies, grants, export oriented units – fiscal & tax concessions, other government initiatives and inclusive entrepreneurial growth. Overview of MSME policy of government in India.

Role of agencies assisting entrepreneurship: DICs, SSIs, NSICs, EDIINIESBUD, NEDB, Entrepreneurship Development Institute (EDI). New initiatives taken by government topromote entrepreneurship in India at larger scale.

Unit 3

From Idea to opportunity: Idea generation- sources and methods, identification and classification of ideas. Individual creativity: idea to business opportunity, Opportunity assessment, challenges of new venture start-up, Venture capital, Angel investing, Crowdfunding

Unit 4

Developing a Business Plan: Environmental Scanning and SWOT analysis, and. The business plan as an entrepreneurial tool, Business Planning Process: elements of business planning, preparation of project plan, components of an ideal business plan – market plan, financial plan, operational plan, and, Feasibility Analysis – aspects and methods: Economic analysis, financial analysis, market-, and technological feasibility.

Unit 5

Launching a New Venture: Steps involved in launching a business (Process charts), Various Forms of business ownership, Registration of business units; start-up to going IPO; revival, exit and end to a venture.

Course Outcome

After successful completion of this course students will be able to-

S. No.	**Course Outcome**	**Bloom's Taxonomy**
1	**CO 1:** Developing understanding of basic concepts of entrepreneurship.	• Knowledge (K 2) • Remembering (K1)
2	**CO2:** Develop knowledge on Entrepreneurial Finance, Assistance and role of Entrepreneurial Development Agencies	• Applying (K 4) • Analyzing (K 5) • Evaluating (K7)
3	**CO 3:** Develop understanding of converting an Idea to an opportunity and develop understanding of various funding sources	• Analyzing (K 5) • Evaluating (K7)
4	**CO 4:** Comprehend and develop skills to Develop a Business Plan.	• Comprehending (K3) • Synthesizing (K6)
5	**CO 5:** Students to have a basic understanding of Launching a New Venture	• Applying (K4) • Synthesizing (K6) • Evaluating (K7)

Suggested Readings

1. Roy :Entrepreneurship, OUP
2. Entrepreneurship 10th Ed (Indian Edition) 2016 by Robert Hisrich Michael Peters Dean Shepherd, McGraw Hill
3. Khanka, S.S.; Entrepreneurial Development; S. Chand and Co.
4. Kumar, Arya; Entrepreneurship; Pearson Education.
5.Desai, Vasant; Dynamics of Entrepreneurial Development and Management; Himalaya Publishing
6. Blundel, R. and Lockett, N.; Exploring Entrepreneurship Practices and Perspectives; Oxford Publications.
7. Dollinger, M. J.; Entrepreneurship: New Venture Creation; PHI Learning.

Skills	**Measuring tool**
Ability to understand of basic concepts entrepreneurship, Entrepreneurial Finance, Assistance and role of Entrepreneurial Development Agencies	Assignments + Workshop
Ability to convert an Idea to an opportunity and understanding of Launching a New Venture.	Assignments + Case study +Workshop
Ability to Develop a Business Plan.	Assignments + Case study + Workshop

Elective: **Human Resource Management**

TALENT MANAGEMENT

Code: KMBHR01

Course objective

1. This course focuses on the attraction, acquisition, and retention of talent in organizations
2. A clear understanding of talent management and its linkage with organizational strategy and other HR practices.
3. To provide the understanding of acquiring and retaining the talent in the organization.
4. To provide them the process of identifying and developingthe potential talent to fulfil the present and future need of the organization.
5. In addition, the course will cover the negotiation problems that managers may face in decision-making processes; for example, the hiring negotiation, the promotion negotiation, the firing decision, and HR-relevant cross-cultural negotiation issues.

Credits: **Teaching Hours: 36**

Unit 1 (6hrs)
Introduction to Talent Management: Concept , Meaning & Objectives, Role of Talent Management in building Sustainable Competitive Advantage to a firm; **Key Processes of Talent Management:** Recruitment, Selection, Human Resource Planning, Retention, Talent vs. Knowledge, Consequences of Failure in Managing Talent, **Identifying and Assessing High-Potential Talent**: Current Organizational Practices . **Case Studies**

Unit 2 (8hrs)
Talent Acquisition: Job Analysis, Questionnaires, Interviews, Developing job Description & Job Specification, Attracting and Recruiting the best Talents, Strategic Trends in Talent Acquisition, Talent acquisition management solutions. **HR Planning for Talent Management:** Process (using MS-Excel and quantitative tools), Evaluation of factors affecting HR Planning, Strategic view of Recruitment & Selection. **Case Studies**

Unit 3 (7 hrs)
Recruitment and Selection Process: Introduction, Sources of Recruitment**,** Use of Assessment Centers, Selection Errors & Minimising Selection Errors, Reliability & Validity of Selection Tests, Choosing suitable types of Interviews, Formulating a recruitment strategy for senior level executives. **Employee Engagement**: Process and outcomes of Employee Engagement, Ways of Achieving Employee Engagement; **Talent Development**: Need Analysis, Knowledge Management, Competency Development and Developing Leadership Talent. **Case Studies**

Unit 4 (8hrs)

Employee Retention: Comprehensive approach to Employees Retention, Managing Voluntary Turnover, Dealing with Job Withdrawal; **Strategic Compensation plan for Talent Engagement**: Defining the Elements of Total Rewards, Integrated Rewards Philosophy, Designing Integrated Rewards, Sustainable Talent Management and Reward Model. , Career and Succession Planning. **Case Studies**

Unit 5.(7hrs)

Emerging Trends in HR: Human Resource Audits, Human Resource Information System (HRIS), Human Resource Accounting (HRA), Business Process Re-engineering, Contemporary Talent Management Issues and Challenges. **Case Studies**

Course Outcome

After successful completion of this course students will be able to-

CO 1: Knowledge of Talent Management Processes	K1(Remember) K2(Understand)
CO 2: Understanding for analysis of the impacts of Talent management in the organization	K1(Remember) K2(Understand) K3(Apply) K4(Analyse)
CO 3: Competency to implement Talent Management practices	K4(Analyse) K5(Evaluate) K6(Create)
CO 4: Competency to develop leadership qualities among subordinate	K4(Analyse) K5 (Evaluate)
CO 5: Knowledge about the reward system to support Talent management	K2(Understand) K3(Apply)

Suggested Readings:

1. Gowri Joshi &VeenaVohra, Talent Management, cengage Learning
2. Dessler Gary, VarkkeyBiju, Fundamentals of Human Resource Management, Pearson Publication,14th Edition References:
3. Lance A Berger, Dorothy R Berger,Talent Management Hand Book, McGraw Hill
4. Hasan, M., Singh, A. K., Dhamija, S. (eds.), Talent management in India: Challenges and opportunities, Atlantic Publication
5. Rob Silzer (Editor), Ben E. Dowell (Editor), Strategy-Driven Talent Management: A Leadership Imperative, Wiley
6. K.Aswathappa – Human Resources and Personnel Management, Tata McGraw Hill
7. Robbins SP, Timothy A, Judge &SanghiSeema, Organizational Behaviour, Pearson Education, New Delhi ,13th edition.
8. Sonal Minocha: Talent Management (Sage Publication)

Employability Skills:

Functional Skills	Measurement
1. Laying foundation of critical thinking Skills	Cases+ Exercise
2. Developing students to strategically formulate talent management tools.	Exercise+ Case
3. Developing analysis of multiple perspectives of Talent Management	Case/Workshop
4. Developing an understanding of how to manage other people (i.e. their subordinates or peers) and themselves with regard to career-related issues.	Case

Performance and Reward Management

Code: KMBHR02 Course Credits: 3 Teaching Hours: 36 Hr

Course Objective:

1. To create an understanding of the key concepts of performance management and contemporary methods for administering compensation and rewards in practices.
2. To articulate the benefits of using a performance development plan and the consequences of not having one in place.
3. To distinguish the elements of an effective, integrated performance development system.
4. To devise “SMART” annual performance objectives (e.g., objectives that are specific, measurable, attainable, relevant and track able).
5. To familiarize the students with the concept of competency mapping and understanding its role in career development.
6. To familiarize students with various aspects of compensation system in India and make them understand various issues linked with the process of fixing salary dearness allowance, bonus, incentive scheme and benefits.

Unit1: (7 hours)

Introduction to Performance Management System : Meaning, Uses and purpose of Performance Management, Performance Management vs Performance Appraisal, Performance management and its challenges in current scenario, Performance management as a System and Process, Establishing Performance Criterion of developing an Effective Appraisal System, Criteria (KRA, KSA VS KPI). **Case Studies**

Unit2: (7 hours)

Managing Performance: Methods of managing performance of all the levels of Management, 360 degree Performance Appraisal, MBO and Performance analysis for Individual and organizational development. **Case Studies**

Unit3: (7 hours)

Contemporary Issues: Potential appraisal, Competency mapping & its linkage with Career Development and Succession planning, **Balance score card**: Introduction and Applications, Advantages and limitations. **Case Studies**

Unit 4: (7 hours)

Reward System: Compensation- Definition, Function, and significance. **Job evaluation**: Methods of job evaluation, Inputs to job evaluation, Practical implication for technical/non-technical and executive/managerial positions and significance of wage differentials. **Case Studies**

Unit 5: (8 Hours)

Compensation: Method of pay and Allowances, Pay structure: Basic Pay, DA, HRA, Gross Pay, Take home pay etc. Incentive schemes**; Methods of payment**: Time and piece rate. **Fringe benefits & other allowances**: Overtime, City compensatory, Travelling etc. **Regulatory compliance**: Introductions, Wage and Pay commissions, Overview of minimum wages Act- 1948 and Equal Remuneration Act-1976. Profit Sharing options; **Case Studies.**

Course Outcomes & Bloom's Taxonomy

CO 1: Knowledge of Performance Management and Performance Appraisal	K1(Remember) K2(Understand)
CO 2: Competency to understand the importance of importance of Performance Management	K1(Remember) K2(Understand)
CO 3: Knowledge about the Compensation and Reward Systems	K1(Remember) K2(Understand)
CO 4: Competency to implement the effective reward systems in the organization	K3(Apply) K4(Analyse) K5 (Evaluate)
CO 5: Ability to explain the relevance of competency mapping and understanding its linkage with career development	K1(Remember) K2(Understand) K3(Apply)

Suggested Reading:

1. T V Rao (2007). Performance Management and Appraisal Systems: HR Tools for Global Competitiveness (Response Books)
2. Michael, Armstrong (1999). Performance Management. Kogan Page.
3. Shrinivas R Kandula (2006). Performance Management : Strategies , Intervention & Drivers. Pearson
4. Chadha, P. (2003). Performance Management: It's About Performing Not Just Appraising. McMillan India Ltd.
5. B D Singh (2012). Compensation and Reward Management, Excel Book
6. Robert Bacal (2007). Performance Management ,McGraw-Hill Education.
7. T V Rao : Performance Management :Towards organisational Excellence (Sage Publications)

Employability Skills:

Skills	**Measuring Tools**
Ability to integrate employee performance to business performance.	Exercises
Preparing Pay Roll	Workshop, Exercise
Developing performance appraisal form and performance standards	Exercises

Employee Relations and Labour Laws

Code:KMBHR03

Course Objective:

1. To Provide conceptual framework of Industrial Relation

2. To make students aware with the Indian Labour legislation

3. To make students aware with the basic requirements and mandate of labour legislations

4. To help the students to understand the existing framework of Industrial Relation and Labour legislation.

Course Credits: 3 **Teaching Hours: 36 Hr**

Unit 1: (8 Lectures)

Employee Relations Management (ERM) & Industrial Relation: Introduction and Importance of Employee Relations Management, Employee Relations Management Tool, Aspects of Industrial Relations, Emerging challenges of IR in India, Linking Industrial Relations with economic growth of a country, **Trade Unionism**: Development of trade unionism, functions, type and structure, problems & suggestive remedial measures of trade unions, The Trade Unions Act 1926: Objective, Recognition and registration, Industrial Democracy & Participative Management. **Case Studies**

Unit2: (8 Lectures)

Collective Bargaining: Significance, types & procedure of Collective bargaining **Discipline**: The Industrial Employment (Standing Orders) Act 1961, Misconduct, Disciplinary Action, Types of Punishments, Code of Discipline, Domestic Enquiry, **Grievance Handling in IR**: Grievance Settlement Procedure, Industrial Disputes, Preventive & Settlement Machinery in India. **Employee Participation and Empowerment**: Objectives, Employee Participation, Advantages of Employee Participation, Employee Participation in India, Methods of Participation, Employee Empowerment. **Case Studies**

Unit 3 (6 lectures)

The Factories Act, 1948 & The shop & Establishment Act 1948, The Payment of Wages Act, 1923, The Workmen's compensation Act, 1972 The Industrial Disputes Act, 1947

Unit 4 (7 lectures)

The Payment of Minimum wages act 1936, The Contract Labor (Abolition & regulative) act The ESI Act, 1948 The Trade unions act, 1926, Child Labour (Prohibition & Regulation) Act, 1986 and its latest amendment,

Unit 5 (7 Lectures)

The payment of Bonus Act, 1965 The payment of Gratuity Cat, 1972 The Maternity Benefit Act, 1961 Employee's Provident fund & Miscellaneous Provisions Act, 1952 .

Course Outcome

After successful completion of this course students will be able to-

CO 1: Knowledge of Industrial Relation framework	K1(Remember) K2(Understand)
CO 2: Competency to understand the importance of Employee Relation within the perspective of Industrial Relation	K1(Remember) K2(Understand) K3(Apply) K4(Analyse)
CO 3: Knowledge about relevant Laws of HR management	K1(Remember) K2(Understand) K3(Apply)
CO 4: Competency to interpreted and implement the Labour Laws within organization	K4(Analyse) K5 (Evaluate)
CO 5: Competency to use Collective Bargaining and Grievance redressal Mechanism	K1(Remember) K2(Understand) K3(Apply)

Suggested Readings:

1. Srivastava SC - Industrial Relations and Labour Laws (Vikas, 2000, 4th Ed.)
2. MonappaArun, "Industrial Relations and Labor laws", Tata McGraw Hill Edition, New Delhi, 2007.
3. Taxmann (2009) Labour Laws", Taxmann Allied Services Pvt. Ltd.
4. Sinha, P.R.N., Sinha, InduBala and Shekhar, SeemaPriyadarshini (2004) Industrial Relations, Trade Unions and Labour Legislation, Pearson Education, New Delhi.
5. Mamoria, Mamoria and Gankar, "Dynamics of Industrial Relations", Himalaya Publishing House, New Delhi, 2007.
6. D. P Sahoo: Employee RElations Management - Texts and Cases (Sage Publication)

Employability Skills	Measuring Tool
Ability to identify the mandate (about dates) of the laws	Exercise + workshop
Ability to identify the mandate (Forms) of the laws	Class room discussions
Ability to have a safeguard from the penalty imposed on employer due to Legislation	Exercise + workshop

STRATEGIC HUMAN RESOURCE MANAGEMENT

Code: KMBHR04 **Total Credits: 3** **Teaching Hours: 36**

Objective:

- To ensure that students are able to identify and critically evaluate the various approaches to human resource management and acquire the skills and techniques to access future issues of relevance to various functions of HRM in an organization.
- To equip the students with comprehensive knowledge of HR role in merger and acquisition.
- To acquaint the students with the basic theories, concepts and interventions of Organization Development.
- Tol help the students to think strategically and integrate the activities of HR with the organizations goals.

Unit 1 (8 Hours)

Conceptual Framework & Context of strategic SHRM, Impacts of Globalization on HRM, Changing Nature of Workforce, Development of SHRM, Models of Strategic HRM, Development & delivery of HR strategies, Challenges in Strategic Human Resource Management, Impacts of Strategic HRM, SHRM for Competitive Advantage. Case Studies

Unit 2 (6 Hours)

Implementation of Strategic HRM: Staffing, Training & Development, Strategic Options of Human Resource Development,Impacts of SHRM on Performance, Practicalities in Measuring SHRM Outcomes,Compensation, and Employee Separation. Case Studies

Unit 3 (8 Hours)

HR Strategy, Components of Strategic HRM, Organizational HR strategies, Functional HR strategies, Strategic HRM in Action, Improving Business Performance through Strategic HRM. Employee Engagement and Drivers of Engagement. Case Studies

Unit 4 (8 Hours)

Strategic Knowledge Management, Building Knowledge Management into Strategy Framework, Knowledge Sharing as a Core Competency, HR Dimension to Knowledge Management, Strategic Approach to Industrial Relations, Outsourcing & its HR implications, Human Side of Mergers and Acquisitions three- stage model of M&A. Case Studies

Unit 5 (6 Hours) Global human resource management, Difference between global HRM & domestic HRM; Strategic HR issues in Global Assignments, Expatriates selection & Repatriation, Building a Multicultural Organization, Multinational Organization, Strategic Choice, Leadership & Strategic issues in International Assignment. Case Studies

Suggested Readings

1. Charles R Geer : Strategic Human Resource Management – A General Managerial Perspective (Pearson Education India)
2. Armstrong, Michael & Baron Angela. (2005). *Handbook of Strategic HRM* , (Jaico Publishing House)
3. Mello, Jeffrey A. (2007). *Strategic Human Resource Management*.(Thomson South Western)
4. Regis, Richard. (2008). *Strategic Human Resource Management & Development (* Excel Books.)
5. Catherine Truss, David Mankin, Clare Kelliher:.*Strategic Human Resource Management.* (Oxford University Press).
6. Dhar, RajibLochan. (2008). *Strategic Human Resource Management* (Excel Books.)

7.. Gary Rees & Paul E Smith : Strategic Human Resource Management (Sage Publication

ourse Outcomes & Bloom's Taxonomy

CO 1: Understanding the dimensions of Strategic HRM	K1(Remember) K2(Understand)
CO 2: Apply the learning of SHRM in organizational context	K1(Understand) K3(Apply) K6(Create)
CO 3: Able to evaluate the impacts of SHRM on competitive advantages	K4(Analyse) K5(Evaluate)
CO 4: Desired level of expertise on organizational knowledge management through SHRM	K4(Analyse) K5 (Evaluate) K6 (Create)
CO 5: Understanding the International culture in SHRM	K2(Understand) K3(Apply)

INTERNATIONAL HUMAN RESOURCE MANAGEMENT

Code: KMBHR05 Total Credits: 3 Teaching Hours: 36

Objective:

- To familiarize the students with HR management in Global perspective.
- To make the students understand the complexity of workforce diversity in international context.
- To make the students aware of the international labor relations.
- To help develop an understanding of expatriate's recruitment & training programs.

Unit 1: (8 Lectures)

International Human Resource Management-Overview, Developments leading to International HRM Perspectives,International Human Resource Management: Role and Distinguishing Activities, Organisational Structure and HRM, International Human Resource Planning. Case Studies

Unit 2 (8 lecture)

Staffing Practices in International Human Resource Management, Recruitment and Selection for Overseas Assignments, Global Staffing Practices, International Transfers and Repatriation Strategies, Training and Development in International Context, International Performance Management, Global Compensation Practices. Case Studies

Unit 3(6 Lectures)

Industrial Relations and International Practices in Industrial Relations, Shifts in IHRM and IR, International Strategic Human Resource Management, International Labour Standards, Global Unions, Regional Integration and Framework Agreements. Case Studies

Unit 4 (8 Lectures)

Equal Opportunity and Diversity Management in Global Context. Sensitivity to Cultural Diversity, Global Organisation Structures, Emerging Trends in Employee Relations and Employee Involvement, Convergence or divergence in personnel management in developed and developing economies, Case Studies

Unit 5 (6 Hours)

Emerging Trends in International HRM, HR/IR issues in MNCs and Corporate Social Responsibility, Case Studies

Suggested Readings:

1. Peter J Dowling, Marion Fosting, Allen D Engle Sr- International Human Resource Management (Cengage learning)
2. Anne – WilHarzing, Ashly H Pinnington- International Human Resource Management (Sage Publication)

3. P L Rao – International Human Respource Management (Excel Books)
4. P SubbaRao – International Human Resource Management (Himalaya Publishing)
5. K Ashwathappa&Sadhna Dash – International Human Resource Management (McGraw Hill Education)

Course Outcomes & Bloom's Taxonomy

CO 1: Understanding the Contexts of International HRM	K1(Remember) K2(Understand)
CO 2: Knowledge about the HR Processes in International Context	K1(Understand) K3(Apply)
CO 3: Able to evaluate the impacts of Globalisation on HRM	K4(Analyse) K5(Evaluate)
CO 4: Desired level of expertise on organizational	K4(Analyse) K5 (Evaluate) K6 (Create)
CO 5: Understanding the International culture in SHRM	K2(Understand) K3(Apply)

Specialization Group: Marketing

SALES AND RETAIL MANAGEMENT

Code: KMBMK01 **Credits: 3** **Teaching Hours: 36**

Objectives:

1. To build knowledge, understanding, and skills in Sales and Retail Management.
2. Enable development and implementation of Sales and Retail Management strategies.
3. Help to analyze decision alternatives and criteria in the context of realistic problem situations in Sales and Retail Management.

Unit1: (5 Hours)
Introduction to Sales: Role of selling in marketing, Personal selling, Salesmanship and sales manager, Types of sales personnel, Characteristics of a successful salesman, Theories of selling, Sales management, Process of effective selling.

UNIT 2: (5 Hours)
Building Sales Organization: Types of sales organizations and their structure, Functions and responsibilities of sales person, filling sales positions, Recruitment, Selection, Training and Development, Development and Conducting Sales training programme.

UNIT 3: (9 Hours)
Leading Sales Organization: Sales force motivation, Designing & Administering Sales force compensation plans, Designing incentives and contests, Sales forecasting, Sales budget, Sales quota, Sales territory, Building sales reporting mechanism and monitoring, Sales force productivity, Sales force appraisal.

UNIT 4: (8 Hours)
Introduction to retailing: Growing Importance of Retailing, Factors Influencing Retailing, Strategic Retail Planning Process, Retail Organization, Retail Models and Theory of Retail Development, Modern retail formats in India, Retailing in rural India

UNIT 5: (9 Hours)
Retail stores and operation management: Setting up Retail organization, Retail location Research and Techniques, Trading Area Analysis, Store Layout, Objectives of Good store Design, Controlling Costs and Reducing Inventories Loss, Responsibilities of Store Manager, Store Record and Accounting System, Coding System, Logistic and Information system, Strategies, Retail Sales Techniques & Promotion, CRM & Brand Management in retailing.

Course Outcomes:

Sl. No.	Course Outcome	Blooms Taxenomy
1.	CO1: Students will develop knowledge, understanding and skills in Sales force management.	K1(Remember) K2(Understand)
2.	CO2: Acquainted with better understanding of implementation of sales management strategies.	K1(Understand) K3(Apply) K4(Analyse)
3.	CO3:Develop analytical skills for effective decision alternatives in sales management problems	K4(Analyse) K5(Evaluate) K6(Create)
4.	CO4: Develop the knowledge, understanding and skills in retail management.	K2(Understand) K3(Apply)
5.	CO5: Acquainted with better understanding of implementation of retail management strategies and develop analytical skills for effective decision alternatives in retail operations.	K4(Analyse) K5 (Evaluate)

Text Books

1. Tapan Panda: Sales and Distribution Management, 3 Ed, OUP.
2. Havaldar, K.K., and Cavale, V.M.; Sales and Distribution Management; McGraw-Hill Education
3. Pradhan Swapna; Retailing Management; 5e, McGraw-Hill Education
4 Spiro, R.L., Stanton, W.J.and Rich, G.A.; Management of Sales Force; McGraw-Hill Education
5. Berman, Evans, Chatterjee; Retail Management Strategic approach;13e ,Pearson

Reference Books :

1. Panda, T.K., and Sahdev, S.; Sales and Distribution Management; Oxford Univ Press
2. P. K. Sinha & D. P. Uniyal, : Managing Retailing, Oxford University Press.
3. Still, R.R., Cundiff, E.W. and Govani, N.A.P.; Sales Management; Pearson Education
4. Coughlan, A. T., Anderson, E., Stern, L. W. and El-Ansary, A. I.; Marketing Channels; Pearson Education
5. Futrell, C.M.; Sales Management; Cengage Learning
6. Rosenbloom, B.; Marketing Channels; Cengage Learning

Skills	Measuring tools
Conceptual skills & Analytical Skills, understanding and application of tools and techniques for Sales & Retail Management	Case Study

Consumer Behaviour & Marketing Communication

Code : KMBMK02 **Course Credits: 3** **Contact Hours: 36**

Course Objectives

1. To understand consumer behavior and explain the consumer decision making process
2. To define external and internal influences on buying behavior
3. To provide an understanding of integrated marketing communications (IMC) and its influences on other marketing functions and other promotional activities.
4. Help to understand what advertising is and its role in advertising and brand promotion.
5. Understand the importance of message design and the creativity involved in message designing.

UNIT-1 (4 Hours)

Introduction: Introduction to Consumer Behavior; Applications of consumer behavior knowledge in marketing. Consumers and Customer, Consumer Behavior in the Contemporary Environment. Introduction, Problem Recognition, Information Search, Evaluation of Alternatives, Post-Purchase Behavior, Attribution theory and Diffusion of Innovation.

UNIT-2 (8 Hours)

Consumers as individuals and in the social context: Consumer Perception, Consumer Attitude Formation & Change, Behavioral learning theories and cognitive learning theories to consumer behavior. Reference Groups, Family, Gender & Age Influences, Social Class & Consumer Behavior, Cultural Influences on Consumer Behavior

UNIT-3 (9 Hours)

Marketing Communication: Objectives of Marketing Communication, Functional areas of marketing communication. Integrated Marketing Communication (IMC): concepts and process, Advertising Management: Meaning, Nature and Scope of Advertising, Classification of advertising, Process of Advertising, Fundamentals of Advertising Campaigns, The Creative Brief, and Advertising Appeal. Advertising Agencies – their role, functions.

UNIT-4(10 Hours)

Ad Budget, Methods of Budgeting .Measuring Effectiveness of Advertisement , Legal and Ethical concepts and issues in Advertising, global vs local advertising, decision areas in international advertising, Media Planning and Strategy - Media Types and their characteristics; Setting Media objectives; Steps involved in media planning, ; Media Strategy, Emerging Concepts and Issues in Marketing Communications.

UNIT 5 (5 Hours)

Trade Promotion, its nature, types and objectives, Consumer Promotion: coupons, premiums, Contests and sweepstakes, Refunds and rebates, Sampling, bonus packs and price offs.

Course Outcome

S.No.	**Course Outcome**	**Bloom's Taxonomy**
1	**CO1.** Understand the three major influences on customer choice: the process of human decision making in a marketing context; the individual customers make up; the environment in which the customer is embedded.	Understand (K2)
2	**CO2.** Develop the cognitive skills to enable the application of the above knowledge to marketing decision making and activities	Create (K6)
3	**CO3.** Be able to demonstrate how concepts may be applied to marketing strategy.	Apply (K3)
4	**CO4.** Apply an IMC approach in the development of an overall advertising and promotional plan.	Apply (K3)
5	**CO5.** Enhance creativity, critical thinking and analytical ability through developing an integrated marketing communication campaign	Analyze (K4)

Suggested Readings

1. Consumer Behavior, Schiffman, L. G. and Kanuk, L. L., Pearson.

2. Kruti Shah & Alan D' Souza: Advertising & promotions an IMC perspective- McGraw Hill education

3.Sahney S: Consumer Behaiour, OUP

4. George E Belch & Michael A Belch: Advertising and promotion- An integrated Marketing Communication Perspective-McGraw Hill Education

5. Chunawala & Sethia : Foundations of Advertising Theory & Practice; Himalaya Publishing House

6. Copley Paul: Marketing Communications Management Concepts & theories, Cases and Practices; Butterworth Heinemann Publication.

Skills	**Measuring Tool**
Understanding of consumer as an Individual	Quiz, role play followed by class discussion
Understanding of consumer in group/society	Role play, presentations
Understanding of consumer decision making and post-purchase behavior	Case study analysis, group project

DIGITAL AND SOCIAL MEDIA MARKETING

Code:KMBMK03

Course Objectives:
To help students understand digital and social media marketing practices.
To provide understanding of the concept of social media platforms
To impart learning on various digital channels and how to acquire and engage consumers online.
To provide insights on building organizational competency by way of digital marketing practices and cost considerations.
To develop understanding of the latest digital practices for marketing and promotion.

Credits: 3 **Teaching Hours: 36**

Unit 1 (6 hrs.)

Introduction to Digital Marketing: The new digital world - trends that are driving shifts from traditional marketing practices to digital marketing practices, the modern digital consumer and new consumer's digital journey. Marketing strategies for the digital world - latest practices.

Unit 2 (9 hrs.)

Social Media Marketing -Introduction to Blogging, Create a blog post for your project. Include headline, imagery, links and post, Content Planning and writing. Introduction to Face book, Twitter, Google +, LinkedIn, YouTube, Instagram and Pinterest; their channel advertising and campaigns

Unit 3 (9 hrs.)
Acquiring & Engaging Users through Digital Channels: Understanding the relationship between content and branding and its impact on sales, search engine marketing, mobile marketing, video marketing, and social-media marketing. Marketing gamification, Online campaign management; using marketing analytic tools to segment, target and position; overview of search engine optimization (SEO).

Unit 4 (6 hrs.)
Designing Organization for Digital Success: Digital transformation, digital leadership principles, online P.R. and reputation management. ROI of digital strategies, how digital marketing is adding value to business, and evaluating cost effectiveness of digital strategies

Unit 5 (6 hrs.)
Digital Innovation and Trends: The contemporary digital revolution, digital transformation framework; security and privatization issues with digital marketing Understanding trends in digital marketing – Indian and global context, online communities and co-creation,

Course Outcome
After successful completion of this course students will be able to-

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Students will develop an understanding of digital and social media marketing practices.	Apply (K3),
2	**CO2.** Students will develop understanding of the social media platforms	Evaluate (K5)

3	**CO3.** Students will acquire the skill to acquire and engage consumers online.	Apply (K3), Create (K6)
4	**CO4.** Students will develop understanding of building organizational competency by way of digital marketing practices and cost considerations.	Create (K6)
5	**CO5.** Students will develop understanding of the latest digital practices for marketing and promotion.	Analyze (K4)

Suggested Readings

1. Moutsy Maiti: Internet Mareting, Oxford University Press India
2. Vandana, Ahuja; Digital Marketing, Oxford University Press India (November, 2015).
3. Eric Greenberg, and Kates, Alexander; Strategic Digital Marketing: Top Digital Experts Share the Formula for Tangible Returns on Your Marketing Investment; McGraw-Hill Professional (October, 2013).
4.Ryan, Damian; Understanding Digital Marketing: marketing strategies for engaging the digital generation; Kogan Page (3rd Edition, 2014).
5.Tracy L. Tuten & Michael R. Solomon : Social Media Marketing (Sage Publication)

Skills	Measuring tool
Ability to understand and analyze digital and social media marketing practices.	Assignments + Case study + Workshop
Ability to acquire and engage consumers online.	Assignments + Case study + Workshop
Ability to use Digital and social media marketing for building organizational competency by way of digital marketing practices and cost considerations	Case study + Workshop

Marketing of Services

Code: KMBMK04

Course Objectives

1. To develop an understanding of the basic concepts and issues in service marketing.
2. To build a working service marketing vocabulary so as to understand and discuss marketing concepts in business settings.
3. To learn about key characteristics of service and service processes, customer service experiences, the role of internal stakeholders in service delivery, and organizational challenges of managing service.
4. To strengthen the ability to justify and support decisions through information acquisition and management.
5. To provide an understanding of how service customers determine value in a service exchange and how this translates into a satisfied customer base.

Course Credits: 3 **Contact Hours: 36 Hrs**

UNIT- 1(8 Hours)

Introduction To Services Marketing. Introduction: Definition, Characteristics and Classification of Services, Difference between Product and Services Marketing, Paradigms in Services Marketing, Present Marketing Environment, Services Marketing Mix: Understanding the 7 P's, Strategies for Services Marketing: Segmentation, Targeting & Positioning, Differentiation.

UNIT- 2 (7 Hours)

Understanding Consumer Behavior and Service Design Understanding Consumer Behavior: Services vis-à-vis goods, Consumer Behavior in Services, Customer Expectations and Perceptions of Services – Evaluation of services. Service Development Design & Standards: New Service Development Process – Basic service to potential service, Customer Defined Service Standards, Demand and Capacity Management.

UNIT- 3 (7 Hours)

Delivering, Pricing and Managing Service Promise .Delivering Services: Role of Employees and Customers in service delivery; Role of Intermediaries, Service process – Blue printing – Physical evidence. Pricing of Services: Pricing Considerations and Strategies, Revenue Management. Managing Service Promise: Role of Advertising, Personal Selling, Sales Promotion, Publicity and Public Relations.

UNIT- 4 (7 Hours)

Service Performance. Evaluating Success of Service Offering: Service quality and measurement, Complaint handling, Recovery management, Service Guarantees. Role of CRM, the Gaps Model of Service Quality.

UNIT – 5 (7 Hours)

Overview Of Current Trends In Service Industries . Understanding of Current Trends in Service Industries: Financial, Hospitality, Health, Telecom, Consultancy, Logistics, Education, NGO, Public Utilities, ITES (IT enabled Services), Travel & Tourism, e-Services and Professional Services.

Course Outcome

S.No.	**Course Outcome**	**Bloom's Taxonomy**
1	**CO1.** Understand and explain the nature and scope of services marketing	Understand (K2)
2	**CO2.** Use critical analysis to perceive service shortcomings in reference to ingredients to create service excellence;	Apply (K3)
3	**CO3.** Be able to identify critical issues related to service design, such as identifying and managing customer service experience, expectations, perceptions and outcomes	Analyze (K4)
4	**CO4.** Provide a theoretical and practical basis for assessing service performance using company examples;	Apply (K3)
5	**CO5.** Identify and discuss characteristics and challenges of managing service firms in the modern world	Understand (K2)

Suggested Readings

1. Services Marketing Text and Cases, Vinnie Jauhari & Kirti Dutta, Oxford Uniersity Press.
2. Services Marketing, Zeithaml Valerie and Mary Jo Bitner, Gremler & Pandit, Tata McGraw Hill.
3. Services Marketing, Lovelock, Christopher. Prentice Hall.
4. Services Marketing, Nargundkar, Rajendra. Tata McGraw Hill
5. The Essence of Services Marketing, Adrian Payne. PHI.
6. Services Marketing, Ravi Shankar. Excel Publishing

Skills	**Measuring Tool**
Understanding of fundamentals of services	Presentations, Quiz
Understanding of consumer behavior in services	Role play followed by discussion
Designing and delivering Services	Group assignment, Case study analysis.
Service quality measurement	Group project, presentations
Service performance analysis	Quiz, Debate, Case study analysis

MARKETING ANALYTICS

Code: KMBMK05

COURSE OBJECTIVES

- To understand the basic concepts of Marketing Analytics
- To study various tools to have marketing insights in various marketing areas through empirical data
- To interpret the marketing data for effective marketing decision making
- To draw inferences from data in order to answer descriptive, predictive, and
- prescriptive questions relevant to marketing managers

CREDIT: 3 **Teaching Hours: 36**

Unit -1: Introduction to marketing Analytics (4 hrs.)
Meaning, characteristics, advantages and disadvantages of marketing analytics, Market data sources (Primary and Secondary). The new realities of marketing decision making Market Sizing: Data sources, Stakeholders, Applications & Approaches (Top-down and Bottom-up)

Unit-2: Pricing Analytics (9 hrs.)
Estimating Demand Curve: Estimating Linear and Power Demand Curves, Optimize Pricing, Incorporating Complementary Products, Using Pricing subjectively to estimate Demand Curves, Pricing Multiple Products,
Price Bundling & Nonlinear Pricing: Pure Bundling & Mixed Bundling, Determine Optimal Bundling Pricing, Profit Maximizing strategies using Nonlinear Pricing Strategies, Price Skimming & Sales

Unit-3: Customer Analytics (9 hrs.)
Segmentation and Targeting: The segmentation-targeting-positioning (STP) framework, Segmentation, The concept of market segmentation, Managing the segmentation process, Deriving market segments and describing the segments -Cluster analysis, Discriminant analysis, Targeting, The concept of product positioning, Conducting a positioning study, Perceptual mapping using principal components analysis, Incorporating preferences into perceptual maps. Customer Lifetime Value: Concept, Basic Customer Value, Measuring Customer Lifetime value, Estimating Chance that customer is still active, Using Customer Value to value a business

Unit-4: Retailing & Advertising Analysis (8 hrs.)
Market Basket analysis: Computing two way and three way lift Allocating Retail Space and Sales Resources: Identifying the sales to marketing effort relationship & its modeling, optimizing sales effort Advertising Analysis: Measuring the Effectiveness of Advertising, Optimizing advertising, Pay per Click (PPC) Online Advertising

Unit-5: Sales Forecasting & Conjoint Analysis (6 hrs.)
Regression model to forecast sales, Modeling trend and seasonality; Ratio to moving average forecasting method, Using S curves to Forecast Sales of a New Product Conjoint analysis: Conjoint analysis as a decompositional preference model, Steps in conjoint analysis, Uses of conjoint analysis.

Course Outcome
After successful completion of this course students will be able to-

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Students will develop the skill in marketing analytics	Apply (K3), Create (K6)

2	**CO2.** Students will be acquainted with better understanding of real life marketing data and its analysis	Evaluate (K5)
3	**CO3.**Students will develop analytical skill for effective market decision making in real life environment.	Analyze (K4), Create (K6)

Suggested Readings

1. Marketing Analytics: Data-Driven Techniques with Microsoft Excel by Wayne L Winston © 2014 Wiley India Pvt. Ltd. ISBN 9788126548620
2. Marketing Analytics: Strategic Models and Metrics by Stephan Sorger© 2013 Create Space Publishing ISBN 1481900307
3. Marketing Engineering and Analytics by Gary Lilen, ArvindRangaswamy,and Arnaud De Bruyn© 2017 Decision Pro, Inc.

Skills	Measuring tool
Ability to understand and analyze markets with numbers and analytic tools.	Assignments + Case study + Workshop
Ability to understand real life marketing data and its analysis	Assignments + Case study + Workshop
Ability to use analytical skill for effective market decision making in real life environment	Case study + Workshop

Specialization: Finance

Investment Analysis & Portfolio Management

Code: KMBFM01 **Course Credits: 3** **Teaching Hours: 36 Hrs**

COURSE OBJECTIVE:

This course will emphasize an understanding of the economic forces that influence the pricing of financial assets.

1. Understanding of investment theory will be stressed and tied in with discussion of applicable techniques such as portfolio selection.

2. The course material will cover formulae that can be applied in different business situations regarding active portfolio management.

3. To expose the students to the concepts, tools and techniques applicable in the field of security analysis and portfolio management.

4. To provide a theoretical and practical background in the field of investments.

Course Credits 3 **Contact Hours 36 Hrs**

Unit I Investment (08 Hrs)

Overview of Capital Market: Market of securities, Stock Exchange and New Issue Markets - their nature, structure, functioning and limitations; Trading of securities: equity and debentures/ bonds. Securities trading - Types of orders, margin trading, clearing and settlement procedures. Regularity systems for equity markets, Type of investors, Aim & Approaches of Security analysis.

Unit II Portfolio Theory (10 Hrs)

Risk & Return: Concept of Risk, Component & Measurement of risk, covariance, correlation risk. Fundamental coefficient,Measurement of systematic Analysis:Economic, Industry, Company Analysis, Portfolio risk and return, Beta as a measure of risk, calculation of beta, Selection of Portfolio: Markowitz's Theory, Single Index Model, Case Studies.

Unit III Capital Market & Asset Pricing (06 Hrs)

Technical Analysis: DOW Theory, Support and Resistance level, Type of charts & its interpretations, Trend line, Gap Wave Theory, Relative strength analysis , Technical Versus Fundamental analysis. Nature of Stock Markets: EMH (Efficient Market Hypothesis) and its implications for investment decision. Capital market theorem, CAPM (Capital Asset Pricing Model) and Arbitrage Pricing Theory. Case Studies.

Unit IV (08 Hrs) Bond, Equity and Derivative Analysis: Valuation of EquityDiscounted Cash-flow techniques: Balance sheet valuation, Dividend discount models, Intrinsic value and market price, earnings multiplier approach, P/E ratio, Price/Book value, Price/sales ratio, Economic value added (EVA). Valuation of Debentures/Bonds : nature of bonds, valuation, Bond theorem, Term structure of interest rates.

Unit V Active Portfolio Management (08Hrs)

Portfolio Management and Performance Evaluation: Performance Evaluation of existing portfolio, Sharpe, Treynor and Jensen measures; Finding alternatives and revision of portfolio; Portfolio Management and Mutual Fund Industry

Course Outcomes & Bloom's Taxonomy

After successful completion of this course students will be able to

CO 1: Understand about various investment avenues.	K1 (Remember) K2(Understand)
CO 2: Understand the value of assets and manage investment portfolio.	K1(Remember) K2(Understand)
C0 3 : Understand various Models of Investment and its application	K2(Understand) K3(Apply)
CO 4: Understand and create various investment strategies on the basis of various market conditions.	K1 (Remember) K2(Understand) K3(Apply)
CO 5: Measure riskiness of a stock or a portfolio position.	K1 (Remember) K2(Understand)

SUGGESTED READINGS :

Text Books :

1) Ranganatham - Security Analysis and Portfolio Management (Pearson Education, 2nd Ed.)

2) Chandra P - Investment Analysis and Portfolio Management (Tata McGraw Hill, 3rd Ed)

3) Bhatt- Security Analysis and Portfolio Management (Wiley ,1st Ed)
4) Pandian P - Security Analysis and Portfolio Management (Vikas, 1st Ed.)

5) Bodie, Kane, Marcus &Mohanti - Investment and Indian Perspective (TMH, 10th Ed)

Reference Books

1. William F. Sharpe, Gordon J.Alexander and Jeffery V.Bailey: Investments, (Prentice Hall, 6th Ed).

2. Donald E. Fischer and Ronald J.Jordan: Security Analysis and Portfolio Management, (Pearson Education, 6th Ed)

13 Charles P. Jones, Investments Analysis and Management, (John Wiley & Sons, 13 Ed)..

4. Edwin J. Elton, Martin J. Gruber: Modern Portfolio Theory and Investment Analysis, 9/e, John Wiley & Sons, 2001.

5. Sidney Cottle, Roger F. Murray, Frank E. Block, Graham and Dodd: Security Analysis, 5/e, Tata McGraw-Hill, New Delhi, 2002.

Mandate to have basic knowledge about NSE and BSE	Glossary at BSE & NSE Site
Mandate to have some analytical ability to analyze	Exercise +Cases

Mandate to have various mock exercises www.moneycontrol.com www.Valueresearch.com www.Yahoofinance.com

Employable Skills:

Skill	Measurement tool
Numerical Analytical skills	Cases and discussions
Investment skills	Cases ,Onlline trading, Simulation Games
Investment Models application	Exercise and workshop

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Tax Planning & Management

Code: KMBFM02   Course Credits: 3   Teaching Hours: 36 Hrs

COURSE OBJECTIVES:

- The present course aims at familiarizing the participants with the principles, problems and structure of different types of taxes in Indian economy.
- A student of taxation will have to make a detailed study of tax policy and tax provisions in India.
- A broad understanding or role of taxation in economic and industrial development of an economy.
- Acquaint about the relevance of direct and indirect taxes in taking corporate decisions.
- Familiarize students about the relevance of GST in taxation policy of the economy.

Course Credits 3   Contact Hours 36 Hrs

Unit I (6 Hours)

Introduction: Definition, Cannons of Taxation Person, Assesse, Income, Previous Year, Assessment Year,Income Tax Important Dates and Forms. Residential Status & Tax Incidence: Individual Income Exempted from Tax.

Unit 2 (10 Hours)

Heads Of Income Heads of Income – Salaries, Income from House Property, Profits & Gains from Business or Profession, Capital Gains, Income from Other sources., Clubbing of incomes, Calculation of Taxable Income ,Tax Calculation including Surcharge and Marginal relief,Deduction, Rebate, Relief, Set Off & Carry Forward of Losses – Principles, Meaning, Inter – sources & Inter – head Set Off.

Unit III (8 Hours)

Tax Planning & Management Tax Avoidance, Planning, & Evasion, Income Tax Authorities- Their appointment- Jurisdiction-Powers and functions- Provisions relating to collection and recovery of tax- Refund of tax, Offences, penalties and Prosecutions, Appeals and Revisions, Advance Tax, TDS, Advance Rulings, Avoidance of Double Taxation Agreements.

Unit IV (6 Hours)

Corporate Tax Computation of taxable income, Carry-forward and set-off of losses for companies, Minimum Alternative Tax (MAT), Set-off and Carry-forward of Amalgamation Losses, Tax Planning for Amalgamation, Merger and Demerger of Companies, Tax Provisions for Venture Capital Funds.

Unit V (6 Hours)

Introduction to GSTGST Concepts –Advantages and Limitations of VAT – GST as the preferred Tax Structure.Model of GST. Need for Tax Reforms, GST Principles – Single GST, Dual GST; Transactions covered under GST; Impact of GST. Registration and Filing: – Rates of Tax – Rates in Foreign Countries – In India; Assessment and Administration of GST.

Course Outcomes & Bloom's Taxonomy

After successful completion of this course students will be able to

CO 1: Understand about various Tax provisionsand Tax planning	K1 (Remember) K2(Understand)
CO 2: Understand the scope of tax planning concerning various business and managerial and strategic activities can be explored	K1(Remember) K2(Understand)
CO 3: Have knowledge about various Tax Dates, Rates and Forms	K2(Understand) K3(Apply)
CO 4: Measure Corporate Tax and Taxation in case of business restructuring	K1 (Remember) K2(Understand) K3(Apply)
CO 5: Understand how GST can be calculated & managed.	K1 (Remember) K2(Understand)

SUGGESTED READINGS

Text Books :

1. Dr. Vinod K. Singhania& Dr. Monica Singhania Students Guide to Income Tax (TaxmannPublication ,Latest Edition according to assessment year

2. Dr.B.K. Agarwal& Dr. Rajeev Agarwal Tax Planning and Management(NirupamPublication,Latest Edition according to assessment year)

3. Paolo M. Panteghini Corporate Taxation in a Dynamic World (Springer, Latest Edition)

4. GirishAhuja& Ravi Gupta Direct Tax Laws & Practice (Bharat Law House, Latest Edition)

5.Datey V.S. - Indirect Taxes – Law & Practice (Taxman ,Latest Edition) 6.E. A. Srinivas Corporate Tax Planning(Tata McGraw Hill, Latest Edition)

Reference Books &Journals :

1. Dr.Vinod K. Singhania& Dr. KapilSinghania Students Guide to Income Tax (TaxmannPublication ,Latest Edition)

2. Parthasarathy Corporate Governance: Principles, Mechanisms & Practice (Wiley, Latest Edition)

3. H. P. Ranina Corporate Taxation (Orient Law House, Latest Edition)
4.Balachandran- Indirect Taxes (PHI, Latest Edition)

5.Income Tax Reports, Company Law institute of India PvtLtd(Chennai Latest Edition)

6.Taxman, Taxman Allied SerivesPvtLtd.(New DelhiLatest Edition)

Employable Skills:

Skill	Measurement tool
Analytical skills	Cases and discussions
Tax calculation and filing skills	Cases ,Exercises
GST Calculation	Exercise and workshop

Financial Market and Services

Code: KMBFM03 Course Credits: 3 Teaching Hours: 36 Hrs

Course Objective:

- To impart knowledge of the financial system of India, the role of important financial institutions, financial markets and financial instruments.
- Familiarizing the students with the mechanism of commercial banking, its operations, instruments regulations etc.
- Helping students in acquiring analytical skills in the money and capital market in the context of raising medium and long term funds
- Familiarizing the students with the microfinance as a growing source of financial mechanism
- Developing an appreciation among the students for the Banking services and products.

SYLLABUS

UNIT I : Introduction (3 Hours)

Structure of Indian financial system: An overview. Theories of the Impact of financial development and savings; Prior saving theory, Credit creation Theory, Theory of forced savings, Financial regulation theory, Financial liberation Theory.

UNIT II: Financial Institutions (11 Hours)

Reserve Bank of India: organization, management and functions, Recent monetary policy of RBI, Commercial banks: meaning, functions, present structure, types, e-banking and recent developments in commercial banking, NBFC, Sectorial financial institution NABARD, Exim Bank and PFC

UNIT III: Financial Markets (8 Hours)

Money and capital market, Money market: meaning, constituents, functions of money market, Money market instruments: call loans, treasury bills, certificates of deposits, commercial bills, trade bills, Recent trends in Indian money market, Capital market: primary and secondary markets, their role recent developments, Government securities market, SEBI: objectives and functions.

UNIT IV Microfinance, Development (7 Hours)

Overview of micro finance; Types of micro finance; Income generating activities and Micro Enterprise Market (demand) analysis, Technological analysis, Socio-economic analysis, Environmental analysis. Logical framework, Implementation & Monitoring Credit Delivery Methodology; Strategic Issues in Microfinance: Sustainability.

UNIT V: BANKING (7 Hours)

Banking role and structure of banking in India, Products and services of Banking: Types, features and its working, Third party products:LifeInsurance, Mutual fund, Equity, General Insurance

Course Outcomes

After successful completion of this course students will be able to:

S.No	Course outcomes	Bloom's taxonomy
Co1.	Recognixze the functioning and working of variousfinancial institutions in India thus in turn connecting it to the working of Indianeconomy.	Knowledge (K1)
Co2	Interpret the knowledge about the working of various financial instruments in the primary and secondary market in India as well as foreignmarket.	Understand (K2)
Co3	Classify about the working of micro finance instruments inIndia as well as foreign market	Understand (K2)
Co4	Interpret the knowledge about the banking industry and demonstrate the various market demand analysis	AnalyzeK4)

Text Books

1. Bhole,L M ; Financial Institutions and Markets; McGraw-Hill Education
2. Kohn M, Financial Institutions and Markets, OUP
3. Pathak, Bharti V.; Indian Financial System; Pearson Education
4. Khan, M.Y.; Indian Financial System; McGraw-Hill Education
5. Varshney ,P.N ; Banking law and practice ; Sultan Chand and Sons

Reference Books

1. Singh, S.P.; Indian Financial System; Wisdom Publication
2. Machiraju, H.R.; Indian Financial System; Vikas Publishing House
3. Desai, Vasant; Fundamental of Indian Financial System; Himalaya Publishing House
4. Varshney, P.N. and Mittal, D.K.; Indian Financial System; S. Chand and Co.

Skills	Measuring Tool
Ability to know Indian financial system	Lecture +Assignments
Ability to know Money & Capital Market	Case study +workshops
Ability to know various market demand analysis	Case study+ workshops

Working Capital Management

Code:KMBFM04 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Course Objectives:

- To have a basic understanding of the concept and importance of sound working capital strategies of a firm.
- To have an understanding of the impact of working capital policies relating to Cash management, inventory and receivables management on firm's profitability.
- To gain an insight into the sources of working capital financing.

Unit- I : Introduction to Working Capital (10 Hrs) Nature, Scope and Definition of Working Capital, Types of working Capital, Determinants of working capital , Working Capital Cycle, Assessment an Computation of Working Capital Requirement, Profitability–Liquidity trade-off, Working Capital Policy - Aggressive & Defensive. Overview of Working Capital Management

Unit - II : Management of Cash and Marketable Securities (8 Hrs)
Meaning of Cash, Motives for holding cash, objectives of cash management, factors determining cash needs, Cash Management Models, Cash Budget, Cash Management: basic strategies, techniques and processes, Lock Box system and concentration banking, compensating balances ; Marketable Securities: Concept, types, reasons for holding marketable securities, alternative strategies, choice of securities; Cash Management Practices in India.

Unit - - III: Management of Receivables (7 Hrs)
Receivables: Nature & cost of maintaining receivables, objectives of receivables management, factors affecting size of receivables, policies for managing accounts receivables, determination of potential credit policy including credit analysis, credit standards, credit period, credit terms, etc; Collection Policies; Credit Management in India.

Unit - IV: Inventory Management (7 Hrs) Inventory: Need for monitoring & control of inventories, objectives of inventory management, Benefits of holding inventory, risks and costs associated with inventories, Inventory Management: Minimizing cost in inventory, Techniques of Inventory Management - Classification, order quantity, order point , ABC Analysis etc

Unit - V: Working Capital Financing (8 Hrs)

Need and objectives of financing of working capital, short term credit, mechanism and cost-benefit analysis of alternative strategies for financing working capital : accrued wages and taxes, accounts payable, trade credit, bank loans, overdrafts, bill discounting, commercial papers, certificates of deposit, factoring, secured term loans, etc; Pattern and sources of Working Capital Financing in India with reference to Government policies, working capital control and banking policy- Deheja study group, chore committee , Tandon Committee.

Course Outcomes

- After successful completion of this course students will be able to:

S.No	Course outcomes	Bloom's taxonomy
CO1.	Understand the objectives and functioning of WTO	Understand (k2)
CO2	Investigate funds flow cycles and their impact on working capital management objectives.	Understand (k2)
CO3	Compare and contrast the relative merits of alternative working capital policies and the likely short-term and long-term impact on the firm.	Apply (k3) Analyse (k4)
CO4	Formulate appropriate working capital management policies to achieve corporate objectives.	Understand (k2)
CO5	Apply corporate cash management, accounts receivable management, bank relations, and inventory management techniques to maximize the share holders' value.	Understand (k2)
CO6		Apply(K3),Analyze (k4), Evaluate(k5)

SUGGESTED READINGS :

Text Book:

- Rustagi - Working capital Management, Taxmann

Reference Book;

- **Bhalla V.K - Working Capital management, Text and cases, Anmol Publication, Delhi , 11th edition**
- **Rangrajan - Working Capital management, Excel Books**
- Bhattacharya – Working Capital management , 2e, PHI
- Periasamy - Working Capital Management –Theory & Practice, Himalaya
- Sharma - Working Capital Management ,Himalaya publication

Skills	Measuring Tool
Ability to knowvarious working capital techniques	Lecture +workshop +case study
Ability to know various cash management models	Lecture +workshop+case study
Ability to know various inventory techniques	Case study+ workshops
Ability to know various receivable management practices &policies	Case study + assignments.

Financial Derivatives

Code: KMBFM05 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Course Objective:

1. To make students aware of different types of Derivatives
2. To develop an understanding amongst students of financial derivatives and associated regulatory framework
3. To have an understanding of the derivative tools such as options, futures and their application to hedging.

Course Credits 3 **Contact Hours 36Hrs**

Unit – 1 **(08 Hrs)**

Introduction: Derivatives market; Definition, Evolution and features of Derivatives, Types of Derivatives, Forward , futures and options market, Forward market transactions , Forward contracts , Forward market in India , Hedging with forwards.

Unit – 2 **(10Hrs)**

Forwards and Futures: Introduction toForward Contract, features of forward contracts Futures contract , types , functions , distinction between futures and forward , pricing of futures contract, Currency Futures , Hedging in Currency Futures , Speculation and Arbitrage in Currency Futures , Pricing of Futures, Cost of Carry Model , Application of Market Index , Index Futures in the Stock Market , Indian Derivatives Market.

Unit – 3 **(8hrs)**

Options: Introduction to options, Hedging with Currency Options , Speculation and Arbitrage with Options , Pricing Options , General Principles of Pricing , Black Scholes option pricing Model. IndexOptions , Hedging with Index Options, Speculation and Arbitrage with Index Options, Index Options Market in Indian Stock Market , Use of different option strategies to mitigate the risk

Unit – 4 **(10hrs)**

Swap : Financial Swaps, Managing Interest Rate Exposure, Interest Rate Swaps,Currency Swaps , Forward Rate Agreement.

Course Outcome and Bloomberg's Taxonomy:

After successful completion of this course students will be able to

CO 1: Understand about various Derivative instruments	K1 (Remember) K2(Understand)

CO 2: Understand various future and option strategies of hedging risk	K1(Remember) K2(Understand)
CO 3: Have knowledge about various Models and techniques and its application	K2(Understand) K3(Apply)
CO 4: Apply various swap strategies to reduce risk	K1 (Remember) K2(Understand) K3(Apply)

Suggested readings:

1. Thomas Susan, Derivatives Market in India; Tata McGraw Hill,2005
2. Financial Derivatives : Theory, Concepts and practices by S.L. Gupta, PHI, 2013.
3. Financial Derivatives by S.S.S Kumar, PHI ,6th ed.
4. Options, Futures and other Derivatives, John C. Hull; Prentice Hall of India; New Delhi, 10th ed.

Websites:

1. www.bseindia.com
2. www.nseindia.com
3. www.sebi.com
4. www.careratings.com
5. www.crisil.com
6. www.icraindia.com
7. www.capitalmarket.com

Employable Skills:

Skill	Measurement tool
Numerical and Analytical skills	Cases and discussions
Hedging risk strategies	Cases ,Onlline trading, Simulation Games
Derivative Models application	Exercise and workshop

Specialization Group: International Business

International Marketing Code: KMBIB01

Course Objectives

1. To provide understanding of the decision variables a marketing manager may use in an international marketing environment.
2. To gain experience in developing international marketing strategies.
3. Provide understanding of product and pricing decisions appropriate for international market. Develop the basic skills needed to develop an international marketing communications plan and strategy,
4. Provide opportunities for practical implementation of the relevant concepts through analysing a variety of international business scenarios.

Course Credits: 3 **Contact Hours: 36 Hrs**

UNIT 1 (6 Hours)

Introduction, Importance and Challenges – Nature, Importance and scope of International Marketing, Domestic marketing vs. International marketing, International marketing management process , EPRG framework an overview: influence of physical, economic, socio-cultural, political and legal environments on International marketing information, scanning and monitoring global marketing environment.

UNIT 2 (8 Hours)

International Marketing Research Introduction, Concept of Marketing Research, Need for Marketing Research, Approach to Marketing Research, Scope of International Marketing Research, International Marketing Research Process, market surveys, marketing information system International market segmentation, International positioning strategies, International marketing strategies International Market Entry Strategies Introduction, Different Entry Modes and Market Entry Strategies, joint Ventures, Strategic Alliances, Direct Investment, Manufacturing and Franchising.

UNIT 3 (8 Hours)

International Product Policy and Planning Introduction, Product Planning in International Markets, Packaging and Labeling, International Product Life Cycle, Branding decisions in international markets: standardization vs Adaptation , Protecting brand names

Unit 4 (8 Hours)

International Pricing Policy: Introduction, Price and Non-Price Factors, Methods of Pricing, International Pricing Strategies, Dumping and Price Distortion, Counter Trade Legal and Ethical Issues in International Marketing Introduction, Nature of International Business Disputes and Proposed Action, Legal Concepts Relating to International Business

Unit 5 (6 Hours)

International Promotional Strategies Introduction, Communications Process, principles of communication, Status of Promotion, Promotion Appeals, Media Selection, Personal Selling, Public Relations and Publicity, Sales Promotion, advertising, e-marketing International e-tailing, concept and types, benefits, segmentation, pricing and promotional strategies in e-tailing.

Course Outcome

S.No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Identify and analyse opportunities within international marketing environments.	Analyze (K4)
2	**CO2.** Undertake strategic business analysis in order to develop appropriate international marketing objectives and strategies.	Analyze (K4)
3	**CO3.** Identify, analyse, and evaluate information, and evidence related to international business opportunities and threats relevant in the current world.	Analyze (K4)
4	**CO4.** Develop proper product and pricing decisions in a particular target market.	Apply (K3)
5	**CO5.** Understand process of international marketing communication strategies and adapting to specific market needs.	Understand (K2)

Suggested Readings

7. Nargundkar- InternationalMarketing (Excel Books)
8. Czinkota - International Marketing (Thompson, 8th Ed.)
9. Kotabehelson- International Marketing(Wiley, 6th Ed.)
10. Cateora Graham - International Marketing (TMH, 10th Ed.)
11. Siddiqui- InternationalMarketing (Wiley Dreamtech)
12. Cherunilam F - International Trade and Export Management (Himalaya, 2007) REFRENCE BOOK
13. Varshney R.L, Bhattacharya B - International Marketing Management (Sultan Chand & Sons, 9th Ed.)
14. Jain S. – International Marketing (Thomson)

Skills	**Measuring Tool**
Prepare an international marketing plan	Workshop, case study
Analyzing the social, political, legal, and economic forces that affect the business performance of international marketing .	Workshop, case study
Develop a global marketing communication plan to promote the Brand	Workshop, case study

INTERNATIONAL LOGISTICS

Code: KMBIB02 **Course Credits: 3** **Teaching Hours: 36 Hrs**

COURSE OBJECTIVES : The objectives of this course are :

1. To gain a working understanding of logistics principles
2. To introduce key activities performed by the logistics functions.
3. To understand the aspects of shipping industry and freight system
4. To understand the ports facilities and global air transportation.
5. To understand the role and importance of information and communication technology in logistics management.

UNIT 1 (6 sessions)

Introduction to Logistic System: Concepts of Logistics, Scope and Objectives of Logistics, System Elements, Importance of Logistics, International Logistics development, International trade logistics Chain, Shippers logistics requirement in trade

UNIT 2 (8 sessions)

Structure of Shipping Industry, Different type of Ships, Shipping Routes, Operating Ships-Linear and Tramp, Organization of a Shipping Company, Shipping Formalities, Conference System, Chartering-Types, principles and practices; Charter party agreement

Transportation, Transport Fundamentals: Importance of effective transportation system; Service choices and their characteristics; inter-modal services; Transport cost characteristics and rate fixation; In-company management vs. out –sourcing.

UNIT 3 (8 sessions)

Warehouse management , Inventory management, Ocean freight rates: freight or tariff rates, freight surcharge, freight rebates. Principles of Freight Rates, Linear Freight Structure, Tramp Freight Structure, Shipping intermediaries: customs broker, freight forwarders, shipping agents, stevedores.

UNIT 4 (8 sessions)

Ports in India, Ports Infrastructure Development, Shipping Association, Shipment of Govt. Controlled Cargo. Concept of Containerization, benefits of Containerization, I.C.D/CFS

International Air transport: Concept of Air Transport, Advantages of Air Transport, Constraints, Air Cargo, Tariff Structure, I.A.T.A.

Unit 5 (6 sessions)

Information and communication technology in logistics management, Reverse Logistics: Application area and activities involved. Internationalization of SCM. Integrated SCM: Concept, span and process of integrated SCM, Supply Chain performance measurement

Course Outcomes:

Sl No	Course Outcome	Blooms Taxenomy
1.	CO1 : To view logistics as more than an operational function that passively executes a plan, but as a strategic function that creates value and competitive advantage.	K1(Remember) K2(Understand)
2.	CO2: Develop in the right way the process of organizing and conducting the proceedings relating to the transport and shipping .	K1(Understand) K3(Apply) K4(Analyse)
3	CO3: Develop in the right way the process of setting up and managing warehousing operations.	K4(Analyse) K5(Evaluate) K6(Create)
4.	CO4: Able to carry basic assessment of sea and air freight shipments, ports/ infrastructure and work environment.	K4(Analyse) K5 (Evaluate)
5.	CO5: Understand the use and impact of e-commerce in logistics management.	K2(Understand) K3(Apply)

TEXT BOOK

1. Ganapathi S.L, Nandi S.K Logistics Management OUP
2. Dr. Sudalaimuthu and S. Anthony Raj, Logistics for International Business: Text and cases, Prentice Hall India, New Delhi.
3. Bowersox, Donal J. and David Closs, Logistical Management, 5th ed., McGraw-Hill
4. Johnson J, Wood D- Contemporary Logistics.
5. Singh, R: International Trade Logistics , OUP.

REFRENCE BOOK

1. Reji Ismail- Logistic Management (ExcelBooks)
2. Dornier- Global Operation & Logistic Management (John Wiley)
3. Khanna K K - Physical Distribution Management : Logistical Approach (Himalaya, 2007)

Skills	**Measuring tool**
Understands international logistics Systems	Case study + Workshop
Basic assesssment of freight	Exercise + Workshop

Export Import Documentation

Code: KMBIB03 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Corse Objectives:

- The basic objective of this course is to provide to the country a steady stream of competent young men & women with the necessary knowledge, skills and foundations for acquiring a wide range of rewarding careers into the rapidly expanding world of Import & Export Management

- To promote basic understanding on the concepts of export and import

  documentations to enable them to realize the impact of documentations.

Unit 1 Introduction-
(8Hrs)

Introduction to exports, Registration process, Selection of products and market Payment terms, Export costing and pricing , Preliminaries for exports. Registration – IEC, RCMC, EPC, Central Excise.(*BCMC changed to RCMC)* Categories of Export, Physical – Direct & Indirect, Deemed ExportsMerchant& Manufacturer Exports

Unit 2 (8Hrs)

Shipment procedures, Role of clearing and forwarding agent, Cargo management Containerization, Shipping documents and terms used in shipping, Export Procedures Excise clearance for exports, Marine insurance of Export cargo Shipment goods, Quality and Pre Shipment inspection, EGC Services, GSP rules of origin

Unit 3 (8Hrs)

Meaning and importance of letter of credit, Documentation papers of L/CEXPORT incentives, risk and insurance, Benefits of Exports, xcise clearance Benefit / Rebate, Income Tax Benefit , *(IPRS is discountiued),* Shipment & Transport – Sea, Air, Rail, Road, Pipeline, Role of overseas agent & remittance of commission.

Unit 4 – (12Hrs)

The organization of exports –imports firms and business planning, Planning of export/import operations. Import procedures Overview of various export promotion schemes Duty Drawback- Advance License, (*Replenishment Licenses, SpecialInterest License is discontinued),* Remission Scheme, DEPB Scheme

Unit 5 (4Hrs)

Export Promotion Capital Goods Scheme. Diamond & Jewelry, Agricultural & Pharmaceutical product exports promotion, scheme. Export of Principal Commodities in India, SEZ, EHTP,STP& EOU's, Types of Export Houses.

(Free trade zones have been changed to SEZ)

Employable Skills:

Skill	Measurement tool
Entrepreneurial skill	Workshop on business planning
Managerial competitive Skill	Assignment on swot analysis
Business acumen	Case studies

Course Outcomes

After successful completion of this course students will be able to:

S.No	Course outcomes	Bloom's taxonomy
CO1.	Identify the process of Registration process, Payment terms, Export costing and pricing.	Knowledge (k1)
CO2	**Interpret** the process of Shipment procedures, & summarize the various documents used in Shipping,	Understand (k2)
CO3	Classify the concept ofvarious incentives, benefits&risk involved in shipping process	Understand (k2)
CO4	Discuss the various business planning Import procedures&various export promotion schemes	Understand (k2)
CO5	Demonstrate the various export promotion schemes &Types of Export Houses.	Apply (k3)

Books Recommended:

Text Books

c ramagopa,l Export import Policy Procedure &Documentation,Newage publisher

Reference book :

1.kiran rai Usha,Export import & logistics management--,Eastern economy edition
2.singh, ram,Internationa trade Logistics , Oxford publishing house.
3.New Import Export Policy - Nabhi Publications
4. EXIM Policy & Handbook of EXIM Procedure – VOL I & II
5.A Guide on Export Policy Procedure & Documentation– Mahajan
6.How to Export – Nabhi Publications
7. Export Management – D.C. Kapoor

International Trade Law

Code: KMBIB04 **Credits: 3** **Teaching Hours: 36**

Course Objectives

International Trade Law has two objectives: public and private.

1. The public aspect deals with the harmonization and coordination of national commercial policies
2. Private aspect seeks to provide a legal framework for International commercial transactions between individuals belongi ng to different nationalities. This course covers both public and private aspects.

Course Credits 3 **Contact Hours 36 Hrs**

Unit 1 **(6 Hours)**
The World Trade Organization:

Introduction to International trade and the law of the WTO,Sources of WTO Law, Basic rules and principles of WTO Law, Economic Theories of free trade-Absolute Advantage theory; Comparative Advantage theory; Heckscher–Ohlin theory; Leontief Paradox and New trade theory, Historical background- of WTO- Evolution of GATT as a trading institution and transition of GATT to WTO; Marrakesh Agreement, WTO as an International institution-Origin of WTO; Mandate of WTO; Membership of WTO; Institutional structure of the WTO; Decision-making in the WTO; Other Issues-status of WTO; budget of WTO,

WTO Dispute Settlement - Dispute Settlement Understanding; Principles of Dispute settlement; Institutions of WTO settlement; WTO dispute settlement proceedings; Main challenges to the WTO dispute settlement system, Principles of Non-discrimination-Most favored nation treatment and National treatment obligation, Dumping-Anti-dumping Measures

Unit 2 **(8 Hours)**
The World Trade Organization-2:
WTO jurisprudence on TBT and SPS Agreements-Agreement on Sanitary and Phy to Sanitary Measures; Agreement on Technical barriers to Trade, WTO and environment protection,
General Agreement on Trade in Services (GATs) - Meaning of trade in services, General obligations. Specific obligations. Financial services. Telecommunication services, India and the GATs.
Trade-Related Aspects of Intellectual Property Rights (TRIPs) - IPRS covered by TRIPs. Rights of patentees under the TRIPs. Compulsory licensing .Public health and the TRIPs. Indian response to the TRIPs, Agreement on Agriculture, Trade Related Investment Measures (TRIMS)

UNIT 3 **(8 Hours)**

Transnational Transactions And Resolution: Transnational Commercial Laws: Meaning and scope of Transnational Commercial Law. Evolution of Law Merchant. Sources of Transnational Commercial Law.Movement towards unification of national commercial laws .UNIDROIT and UNCITRAL, International Carriages- Carriage of goods by sea; Carriage by air; Multimodal transportation, International Sales of goods- Vienna Convention on Contract for International Sale of Goods; Drafting of International Commercial contracts- an Introduction. International Payments- The role of International Chamber of Commerce in the development of Transnational Commercial Laws; Uniform Customs and Practices on Documentary Credits. International Commercial Arbitration. UNCITRAL Model Law on International commercial arbitration. Indian Arbitration and Conciliation Act, 1996; Enforcement of foreign arbitral awards.

Unit 4 **(8 Hours)**

Introduction to Law and Policy of Export-Import Trade in India:

Foreign Trade Development and Regulation) Act, 1992. Foreign Exchange Management Act, 1999. Special Economic Zones and International trade. Law relating to Customs- Customs Act, 1962. Foreign Investment in India-Liberalization in the nineties. Foreign Investment Promotion Board.Current issues relating to foreign direct investment. The Industries(Development and Regulation) Act and its application.

Unit 5 **(6 Hours)**

The recent challenges and proposed amendments by third world . Role of SARC and B|RICS

S. No.	**Course Outcome**	**Bloom's Taxonomy**
1	**CO1.** Understand the objectives and functioning of WTO	Remember (K1) Understand (K2)
2	**CO2.** Review and apply the various WTO agreements for effective international trade	Understand (K2) Apply (K3)
3	**CO3.** Analyze the forces that shape the international commercial laws.	Analyse (K4)
4	**CO4.** Understand and evaluate the export import policy in India.	Understand (K2) Evaluate (K5)
5	**CO5.** Analyze the recent challenges in international trade and role of international institutions	Understand (K2) Analyse (K4)

Suggested Readings

Law of International Trade , Author : Dr. Jason Chuah , Edition : 5th South Asian Edition 2017

Foreign Trade - Theory, Procedures, Practices and Documentation by Dr. Khushpat S. Jain and Apexa V. Jain

1. International trade law by Dr. S.R MYNENI
2. International Trade Law by Hemant Goel
3. International Trade Law by NiharikaVij

Employability Skills	Measuring Tool
Ability to identify the mandate of the laws	Exercise + workshop
Business acumen	Case studies

Cross Cultural Management

Code: KMBIB05 **Credits: 3** **Teaching Hours: 36**

Course Objectives

1. To consider the nature of intercultural communication
2. To learn to think across cultural differences
3. To experiment with different ways of acting in cross-cultural situations
4. To reflect on the cultural foundations of economic systems and of organizational practices

Course Credits 3 **Contact Hours 36 Hrs**

Unit 1 **(6 Hours)**

Introduction: Understanding culture: Values, world views and socio-cultural systems What is culture and why is it important? How do people react to cultural differences?

Can we measure or graph cultural differences? Is it possible to change a culture? If so, how? What does culture have to do with business? Ways of describing cultural differences Going International, (**Assignment)**: Come to class with an idea for discussion

Unit 2 **(8 Hours)**

Cultural diversity and multicultural teams: The impact of cultural differences on individuals, Verbal and non-verbal communication across cultures, Kohlberg's theory of moral reasoning, Measuring cultural development, The historical origins of beliefs and values, Impact of cross cultural communication, **,** Kohlberg, Malcolm X, and Martin Luther King Jr, Are some societies better than others?, Relativism vs. development, Respect cultural differences vs. stages of development, The possibility of an international subculture

Unit 3 **(8 Hours)**

Conflict and negotiation: Gender differences**,** Gender, multiethnicity, religion, geography Body language, The culture of poverty, Hofstede's dimensions, Cultural aspects of international business negotiations, Negotiation process, Negotiation Strategies

Unit 4 **(8 Hours)**

Cultural diversity and multicultural teams: National cultures vs. organizational cultures, Knowledge cultures, Cross-cultural intelligence and managerial competence, Motivating across cultures, Management of cross-culture teams, Leadership traits required for managing cross culture teamsParticipatory Strategic Planning and the Technology of Participation Change in corporate culture: the example of quality improvement

Unit 5 **(6 Hours)**

Culture and ethics: Understanding significance of cultural values & ethics in cross boarder businesses, Corporate Culture and Cros Border HRM and Employment Practices with respect to Japan, European countries, US, China, corporate social responsibility in MNC's , The McDonald's Corporation

Course Outcome

After successful completion of this course students will be able to

S. No.	Course Outcome	Bloom's Taxonomy
1	**CO1.** Understand and apply different meanings and dimensions of "culture"	Understand (K2) Apply (K3)
2	**CO2.** Describe and analyze the impact of culture on business practices	Understand (K2) Analyze (K4)
3	**CO3.** Explain and evaluate the impact of national culture on organizational cultures	Evaluate (K5)
4	**CO4.** Understand the impact of culture on Human Resource Management	Understand (K2)
5	**CO5.** Explain how leadership differs across cultures	Understand (K2)

Suggested Readings

1. Cross culture management by Ms Shobhana Madhavan, Oxford University Press, 2011
2. Eastern and Cross Culture Management by N K Singh , Springer
3. Gannon, Martin J. Paradoxes of Culture and Globalization. Sage Publications, 2008.

- Class notes are available at www.gwu.edu/~umpleby/mgt216
- For information on group projects see www.gwu.edu/~rpsol/service-learning

Skills	Measurement tool
Entrepreneurial skill	Workshop on business planning
Managerial competitive Skill	Assignment
Business acumen	Case studies

Specialization Group: Information Technology

ENTERPRISE RESOURCE PLANNING

Code: KMBIT01 **Course Credits: 3** **Teaching Hours: 36**

Course Objectives:

1. Impart knowledge about Enterprise Resource Planning (ERP)
2. Impart knowledge of related technologies
3. Impart knowledge about implementation of ERP
4. Analyze the applications of ERP at operational levels
5. Analyze the applications of ERP at managerial practices.

Unit 1 **(8 Hours)**

Enterprise: Overview of Enterprise Resources & Business Functions, Classifications of Business Processes, Business Process Management System; **Information**: Characteristics and Value of information in enterprise; **Information System:** Components of an Information System, Characteristics and uses of Decision Support System, Executive Information System & Management Information System; **Business Process Modeling**: Automation and Structuring of Business Processes, Business Process Reengineering (BPR). Cross Functional and Integrated Enterprise Systems; **Case Studies**

Unit 2 **(6 Hours)**

Enterprise Systems and Enterprise Resources Planning (ERP): Characteristics of Enterprise Systems, Enterprise Applications and ERP, Evolution of ERP System, Benefits of an ERP System; **ERP Related Technologies**: Database & Data Warehouse, Data Mining, On-Line Analytical Processing, Workflow Management Systems. **Case Studies**

Unit 3 **(8 Hours)**

ERP Modules: Finance, Production planning, Sales & Distribution, Human resource management (HRM), Inventory Control System, Quality Management, ERP in Supply Chain Management and Customer Relationship Management. **ERP Solutions in the markets and ERP Domains**: Sector specific ERP Solutions, Introduction and Characteristics of SAP, BAAN and Oracle ERP. **Case Studies**

Unit 4: **(8 Hours)**

ERP and Value Chain: Impacts of ERP on Value Chain (Porter's Value Chain Model), Competitive Advantages of ERP; **Future Directions in ERP**: New Trends in ERP, ERP to ERP II, ERP and e-business, SOA Factors in ERP; **ERP Implementation**: Evaluation and Selection of ERP Package, Project Planning, Testing & End User's Training, Post Evaluation and Maintenance, Issues and Challenges in ERP Implementation, Latest ERP Implementation Methodologies; **Case Studies**

Unit 5 **(6 Hours)**

ERP Project Team: Composition, Organization and Working of ERP Implementation Team, Success and Failure Factors in ERP Project. **Post ERP Implementation**: Organizational Change Management, Post Implementation Review, Post Implementation Support, ERP Security. **Case Studies**

Course Outcomes & Bloom's Taxonomy

1.	CO 1: Knowledge of ERP Technology and its importance	K1(Remember) K2(Understand)
2.	CO 2: Able to analyze the organizational readiness for ERP	K1(Understand) K3(Apply) K4(Analyze)
3.	CO 3: Able to implement ERP in functional area of businesses and	K4(Analyze)

	management	K5(Evaluate) K6(Create)
4.	CO 4: Interpreting the impacts of ERP on business processes	K4(Analyze) K5 (Evaluate)
5.	CO 5: Understanding the Market Trends in ERP applications	K2(Understand) K3(Apply)

S No	Skills	Measuring Tools
1	Practical usage of ERP solutions	Live Demo of ERP Solution
2	Industry Readiness	Discussion + Case Study

Suggested Readings

1. ERP Demystified: Leon, Alexis (McGraw-Hill Education)
2. Concepts in Enterprise Resource Planning: Joseph, A. Brady, Ellen, F. Monk and Wangner, Bret J. (Thomson Learning)
3. Enterprise Resource Planning: Concepts and Planning; Garg, V.K. and Venkitakrishnan, N.K.(PHI Learning)
4. Enterprise Resource Planning – A Managerial Perspective: DP Goyal (TMH)

WEB TECHNOLOGY AND E- COMMERCE

Code: KMBIT02 **Course Credits: 3** **Teaching Hours: 36**

Course Objectives:

1. Impart knowledge about basic concepts
2. Impart knowledge about the significance of web technologies and e-commerce
3. Impart knowledge about different categories
4. Impart knowledge about implementation of e-business
5. Critical assessment of the impact of web based information systems on the business.

Unit 1 **(8 Hours)**

Growth and potential of Internet: History of Web and Internet, Milestones and Latest Trends, Values of Internet for Business; **Website Planning:** Strategies and Approaches, Adding Website profiles, Demographics, Visitors ,Traffic sources, Content, Setting goals and Custom, Sitemap, Diagnostics for errors; **Web Protocols & Technologies:** WWW, FTP, HTTP, Search Engine, Social Networking and Analytics. **Case Studies**

Unit 2 **(7Hours)**

Web Commerce: Definitions, Scope and Significance of Web Commerce, Emerging trends in Web Commerce; **Web Commerce Business Models**: Business to Consumer (B2C), Business to Business (B2B), Consumer to Consumer (C2C), Peer to Peer business model, m-Commerce business model, E – Governance (G2C, G2B, G2G); **Case Studies**

Unit 3 **(8 Hours)**

***et* – Marketing and Trade**: Understanding Internet Audience and Online consumer behavior, Internet Marketing Technologies, *e* – retailing, Online Market Research, Online Marketing Communications Online Advertising, Online Branding Strategies, Online Pricing Strategies; **e - Customer Relationship Management:** Characteristics,Strategies and Technologies; **Case Studies**

Unit 4 **(5 Hours)**

Online Payment System: Online Banking, Advantages and Limitations, Mobile Banking, Concept of Digital cash and Plastic money, Debit and Credit cards; **Security Aspects of Electronic Payment Systems:** Security Threats in Online Environment, Elements of good E-commerce Security, E-commerce Security Plan; **Case Studies**

Unit 5 **(8 Hours)**

Web Page Designing: Introduction to HTML & CSS, Software for Webpage Development, Technologies for using Image, Audio and Videos in Webpage, Implementing Table, Frames and Form Elements; **Website Publishing:** Domain Registration, Hosting a website, Maintenance &Updation,

Course Outcomes & Bloom's Taxonomy:

CO 1: Understanding the nature of Web Technology	K1 (Remember) K2(Understand)
CO 2: Exploring the business potential of Web Technology	K3(Apply) K4(Analyse)
CO 3: Planning and executing the web based business application	K2(Understand) K3(Apply) K4(Analyse)
CO 4: Knowledge about the Information and Web Security	K1(Remember) K2(Understand) K3(Apply)
CO 5: Knowledge about the functioning of online payment systems	K1(Remember) K2(Understand) K3(Apply)

Suggested Readings

1. .Laudon, Kenneth C, and Traver Carol G; E-Commerce – Business. Techn
2. Turban, Efraim, Lee Jae, King David and Chung Michael; "Electronic Commerce – A Managerial Perspective", AddisonWesley
3. Kalakota R; "Electronic Commerce – Frontiers of E – Commerce", Pearson Education
4. HTML - Beginner's Guide - Willart

CLOUD COMPUTING FOR BUSINESS

Course Code: KMBIT03 **Course Credits: 3** **Teaching Hours: 36**

Course Objective: To impart knowledge about cloud computing and its application in business and understanding the importance of information management for a business organization.

Unit 1 **(5 Hours)**
Cloud computing: Introduction, Evolution and Cloud Market; **Technological Influences for Cloud Computing:** Universal Connectivity, Excess Capacity, Open Source Software. **Technology &ServiceModels for cloud computing**: IaAS, PaAS&SaAS.

Unit 2 **(8 Hours)**
Cloud Deployment Models: Public, Community, Private & Hybrid Models, Approaches for Migrating to Cloud. **Information Assurance and Data Protection:** Phases in Information Lifecycle and Key Challenges in Data Lifecycle Security. **Data centre**: Concept its Operations, Data centre Security Recommendations. **Case Studies**

Unit 3 **(7 Hours)**
Enterprise Risk Management: Information security governance processes, Enterprise risk management in cloud computing, Enterprise risk management recommendations. **Case Studies**

Unit 4 **(10 Hours)**
Security: Cyber Threats in Cloud Computing, Application Security Web Application, Attack methods, Web Application Security, Application Security Layer, Security Solutions, **Virtualization:** Hardware virtualization, Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization, Virtualization security recommendations.

Unit 5 **(6 Hours)**
Cloud Computing for Business: Organisational Readiness for Cloud, Business Advantages of Cloud Computing, Traditional Vs Cloud Based Business Solutions, Designing Cloud Based Business Solutions, Business Models for Engaging Cloud Vendors, Issues and Challenges in Cloud based Business Models. **Case Studies**

Course Outcomes & Bloom's Taxonomy

CO 1: Understanding the Technologies in Cloud Computing	K1 (Remember) K2(Understand)
CO 2: Knowledge about the services of Cloud Computing	K1(Remember) K2(Understand)
CO 3: Interpreting the business values of Cloud Computing	K2(Understand) K3(Apply) K4 (Analyse)

CO 4: Knowledge about the Security in Cloud Computing	K1 (Remember) K2(Understand)
CO 5: Knowledge of Virtualisation	K1 (Remember) K2(Understand)

Suggested Readings

1. Mulholland, Andy, Pyke, Jon, and Finger, Peter; Enterprise Cloud Computing: a strategy guide for business and technology leaders; Meghan Kiffer Press
2. Linthicum, David S.; Cloud Computing and SOA Convergence in your Enterprise: A Step-byStep Guide; Addison Wesley Information Technology Series
3. Rhoton, John; Cloud Computing Explained: Implementation Handbook for Enterprises; Kindle Edition
4. Reese, George; Cloud Application Architectures: Building Applications and Infrastructure in the Cloud; O'reilly publication
5. Cloud Computing : Principles and Paradigm-RajkumarBuyya, James Broberg, AndrzejGoscinki (Wiley)

DATABASE MANAGEMENT SYSTEMS

Code: KMBIT04 **Course Credits: 3** **Teaching Hours: 36**

Course Objective: The course has been designed to introduce the students with the applications of systems designed to manage the data resources of organizations. It is also intended to gives an insight to students about the concept of data mining and warehousing.

Unit I **(8 Hours)**

Database Management System: Introduction, Organization and Components of Database Management Systems, Advantages of DBMS. **Database Models**: Relational Database Model, Network Database Model, Hierarchical Database Model, Semantic Database Model.

Unit 2 **(8 Hours)**

Relational Database Design: Concepts, E-R Diagram, Integrity Constraints, Functional dependencies, Concept of Normalisation, Physical Database Design, Decomposition of Relation Schema; **Object Oriented Database Design**: Characteristics and advantages

Unit 3 **(8 Hours)**

Structured Query Language (Oracle): Creating Tables, Applying column constraints, Inserting Rows, Views Snapshots, Indexes & Sequences, Cursor, Triggers, Procedures; Uses of inbuilt Functions & Package.

Unit 4 **(6 Hours)**

Data Warehousing: Characteristics, Functionality and Advantages; **Metadata**: Concepts and classifications; **Data mining Techniques:** Introduction of Association, Classification and Clustering techniques; **Business Applications of Data Mining**: Target Marketing, Risk Management, Customer profiling

Unit 5 **(6 Hours)**

Working with DBMS: Database Utilities, Security, Objects, Basic Database Administration, Remote Data Access. **Distributed Database**: Characteristics and Applications.

Suggested Readings:

1. Navathe E - Fundamentals of Database Systems (Pearson Education, 3rd Ed.)
2. Majumdar and Bhattacharya - Database Management System (Tata McGraw Hill, 1996)
3. Chakrabarti- Advance Database Management System (Wiley Dreamtech)
4. Beynon -Davies P- Database Systems (Palgrave, 2003)
5. Karthikeyan-Understanding Database Management System (Acme Learning)
6. Hoffer - Modern Database Management (Pearson Education, 6th edition)

Course Outcome & Bloom's Taxonomy

CO 1: Knowledge about the DBMS Technology	K1 (Remember) K2(Understand)
CO 2: Understanding the business application of DBMS	K1 (Remember) K2(Understand) K3 (Apply)
CO 3: Application of DBMS for business process	K2(Understand) K3(Apply) K4 (Analyse)
CO 4: Knowledge and uses of Data mining techniques	K1 (Remember) K2(Understand) K3(Apply)

CO 5: Working knowledge of DBMS Software ORACLE	K1 (Remember) K2(Understand) K3(Apply)

SYSTEM ANALYSIS & DESIGN

Code: KMBIT05 **Course Credits: 3** **Teaching Hours: 36**

Course Objective: This course aims at acquainting the students with tools techniques of planning, analyzing, designing, implementing and maintaining Information system.

Unit 1 **(8 Hours)**
Systems: Concept & Characteristics of a System, Elements of System, Types of Systems, Information Management and Information System. **System Development Life Cycle**: Investigation, Analysis, Design, Implementation, Post Implementation Review and Maintenance. **Case Studies**

Unit 2 **(6 Hours)**
Systems Planning and Investigation: Basis for Planning in Systems Analysis, Dimensions of Planning, Initial Investigation, Needs Identification. **Case Studies**

Unit 3 **(6 Hours)**
Requirement Specification: Determining the User's Information Requirements, System Requirement Specification. **Feasibility Analysis:** Study and Considerations in Feasibility Analysis, Feasibility Report. **Case Studies**

Unit 4 **(8 Hours)**
Tools of Structured Analysis: Data Flow Diagram (DFD), Entity Relationship Diagrams, Data Dictionary**; Process Modeling**: Structured English, Decision Tree & Decision Table; Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

Unit 5 **(8 Hours)**
Information Security: Types of Attacks, Viruses, Virus Control, Hackers, Overview of Risks associated with Internet; **Security Risk Management**: Intrusion Detection, Disaster Recovery Plan, Cryptography, Authentication, Information Security Policy, Creating a secure environment, Internet Security Standards. **Case Studies**

Course Outcomes & Bloom's Taxonomy:

CO 1: Understand the Systems and its characteristics	K1 (Remember) K2 (Understand)
CO 2: Knowledge about the Information Systems	K1 (Remember) K2(Understand)
CO 3: Knowledge of System Development Life Cycle	K1(Remember) K2(Knowledge)
CO 4: Applying the phases of SDLC in business information system development	K3(Apply) K4(Analyse)
CO 5: Analysing the impacts of information system on business	K4(Analyse) K5(Evaluate)

Suggested Readings:

1. Kenneth E Kendall and Julie E Kendall – SAD (PHI Publication, 7 Ed.)
2. Shah-Software Engineering &SAD(Wiley Dreamtech)
3. Grienstein and Feinman- E-commerce –Security, Risk Management and Control (TMH, 2nd Ed.)
4. AnkitFadia -Encryption-Protecting your Data (Vikas Publication, 1st Ed.)
5. Singh B –Network Security (PHI Publication, 1st Ed.)

Specialization Group: Operations Management

SUPPLY CHAIN & LOGISTICS MANAGEMENT

Code: KMBOM01 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Course Objectives:

This course is intended to provide an understanding of the components and processes of supply chain and logistics management as well as the performance drivers of supply chain. It is also intended to help the students to learn about logistics, transportation, warehousing and outsourcing decisions.

Unit 1 **(6 Hours)**

Supply Chain Concepts: Objectives of a Supply Chain, Stages of Supply chain, Value Chain Process, Cycle view of Supply Chain Process, Key issues in SCM, logistics & SCM, Supply Chain Drivers and obstacles, Supply chain strategies, strategic fit, Best practices in SCM, Obstacles of streamlined SCM.

Unit 2 **(8 Hours)**

Logistics : Evolution, Objectives, Components and Functions of Logistics Management, Distribution related Issues and Challenges; Gaining competitive advantage through Logistics Management, Transportation- Functions, Costs, and Mode; Network and Decision, Containerization, Cross docking.

Unit 3 **(8 Hours)**

Supply Chain Performance : Bullwhip effect and reduction, Performance measurement: Dimension, Tools of performance measurement, SCOR Model. Demand chain management, Global Supply chain- Challenges in establishing Global Supply Chain, Factors that influences designing Global Supply Chain Network.

Unit 4 **(8 Hours)**

Warehousing: Concept and types, Warehousing strategy, Warehouse facility location & network design, Reverse logistics, Outsourcing**-** Nature and concept, Strategic decision to Outsourcing, Third party logistics(3PL), Fourth party logistics(4PL).

Unit 5 **(6 Hours)**

Supply Chain and CRM- Linkage, IT infrastructure used for Supply Chain and CRM, Functional components for CRM, Green supply chain management, Supply Chain sustainability.

Course Outcomes

S No	Course Outcomes	Bloom's Taxonomy
1.	CO 1: Apply the basic framework of Supply Chain Management and basic concepts in logistics	K1(Remember) K2(Understand) K3(Apply)

2.	CO 2: Knowledge about distribution, warehousing and its roles in strategic planning with supply chain	K1(Remember) K2(Understand) K3(Apply) K4(Analyse)
3.	CO 3: Competency to analyze and use inventory management methodologies and evaluate and select transportation modes	K4(Analyse) K5(Evaluate) K6(Create)
4.	CO 4: Assess the strategic role and impact of IT on supply chain integration	K4(Analyse) K5 (Evaluate)
5.	CO 5: Knowledge about the latest trends in SCM and logistics	K1(Remember) K2(Understand) K3(Apply)

Suggested Readings:

1. Chopra, Sunil, Meindl, Peter and Kalra, D. V.; Supply Chain Management: Strategy, Planning and Operation; Pearson Education
2. Altekar, Rahul V.; Supply Chain Management: Concepts and Cases; PHI Learning Reference Books
3. Ballou, Ronald H.; Supply Chain Management; Pearson Education
4. Sahay, B.S.; Supply Chain Management; Macmillan
5. Ballou, R.H. Business Logistics Management. Prentice-Hall Inc.
6. BowersoxD.J. ,Closs D.J. , Logistical Management, McGraw-Hill, 1996

S No	Skills	MeasuringTools
1	SCM Network Design and Performance Measurement	Workshop, Discussion, & Exercise

OPERATIONS PLANNING & CONTROL

Code: KMBOM02 **Course Credits: 3** **Teaching Hours: 36 Hrs**

Course Objectives:

1. To understand the various fundamentals and functions of production planning and control.
2. To impart learning on work study procedures and practices.
3. To generate understanding on the essentials of product/ process planning and useful tools to accomplish both.
4. To develop knowledge and ability to undertake production scheduling procedures.
5. To know the recent trends in production planning and control such as manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP) and global practices.

Unit 1 **(6 hours)**

Introduction: Meaning and objective of Production Planning & Control, functions, roles & responsibilities of PPC manager. Forecasting – qualitative and quantitative analysis techniques.

Unit 2 **(8 hours)**

Process of Production Planning and Control –
Capacity planning –Concept, types, plant capacity, capacity planning strategies-Routing – procedure, materials flow patterns -Scheduling –production scheduling, machine scheduling and Line Balancing with numerical -Loading –process, strategies and relationship between capacity and loading-numerical, PPC in different production systems ie. Job, batch, Mass (assembly) and continuous

Unit 3 **(8 hours)**

Aggregate Planning –Meaning, Strategies and Cost, concept of Aggregate planning; capital-intensive, labour-intensive, and fashion industries. Materials requirement planning (MRP I), MRP-Manufacturing resource planning (MRP II) – Master production scheduling, Enterprise Resource Planning (ERP) and global practices.

Unit 4 **(7 hours)**

Waste Management : Value and waste, Types of waste; 5S techniques of eliminating wastes, Lean process to minimize wastages

Unit 5 **(7 hours)**

Control Systems: Production control systems, Gantt Charts, Bar Charts, production progress reporting and performance analysis, system feedback, strategies for corrective actions, role of control rooms in production plants.

Course Outcomes:

Sl No	Course Outcome	Blooms Taxenomy
1.	CO1 : It will help in understanding the fundamentals of production planning and profit considerations.	K1(Remember) K2(Understand)
2.	CO2 : It will provide quantitative knowledge and capability to use various product/process planning tools.	K1(Understand) K3(Apply) K4(Analyse)
3	CO3 : It will enable them to devise appropriate strategies concerning aggregate panning and cost.	K4(Analyse) K5(Evaluate) K6(Create)
4.	CO4: It help in resolving complex scheduling issues by way of implementing standard scheduling procedures.	K4(Analyse) K5 (Evaluate)
5.	CO5: It will enhance exposure to recent trends in production planning and control and increase adaptability with latest global-production practices.	K2(Understand) K3(Apply)

Text Books

1. Martand Telsang, “Industrial Engineering and Production Management”, S. Chand and Company, First edition, 2000.
2. S.K. Mukhopadhyay, Production Planning and Control, Prentice Hall of India private limited, 2010.
3. James.B.Dilworth, “Operations Management – Design, Planning and Control for manufacturing and services” Mcgraw Hill International edition 1992.

Reference Books

1. S.N.Chary, “Theory and Problems in Production & Operations Management”, Tata McGraw Hill, 1995.
2. KanishkaBedi, “Production and Operations management”, Oxford university press, 2nd Edition 2007.
3. Elwood S.Buffa, and RakeshK.Sarin, “Modern Production / Operations Management”, 8th Ed. John Wiley and Sons, 2000..
4. Melynk, Denzler, “Operations management – A value driven approach” Irwin Mcgrawhill.
5. Norman Gaither, G. Frazier, “Operations Management” Thomson learning 9th edition IE, 2007
6. K.C.Jain& L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers, 1990.

S No	Skills	MeasuringTools
1	Product/Process Plan development	Workshop, Discussion, & Exercise
2	Costing and aggregate planning	Exercises
3	Production Scheduling tool applications	Exercises

QUALITY TOOLKIT FOR MANAGERS

Code : KMBOM03 Course Credit : 3 Teaching Hours : 36

Learning Objective: This course is designed to help students understand the concepts of Quality Management &Control. It is also intended to help the students develop sufficient level of competency to apply the quality improvement tools and techniques in organizations.

UNIT 1 (6 Hours)

Quality Concepts : Evolution of Quality Management, Concepts of Product and Service Quality, Dimensions of Quality, Quality Philosophies: Deming's, Juran's, Crosby's Quality Philosophy, Quality Cost, Quality Leadership

UNIT 2 (9 Hours)

Process Quality Improvement : Graphical & statistical techniques, 7 QC tools, Regression Control charts, Process capability analysis, Measurement system Analysis, Design and Analysis of Experiment (DOE), Acceptance sampling plan, Process failure mode and effect analysis (PFMEA). SERVQUAL Model with application, case studies.

UNIT 3 (7 Hours)

Product Quality Improvement : Quality Function Deployment, Robust Design and Taguchi Method, Design Failure Mode & Effect Analysis, Product Reliability Analysis.

UNIT 4 (8 Hours)

Quality Management : Quality Circles, TQM, Six Sigma, Six sigma for Process Improvement, Six Sigma in Product Development, Design for Six Sigma.

UNIT 5 (6 Hours)

Quality Standards : ISO-9000 and it concept of Quality management, ISO 14001, ISO 22000, ISO 27001, OHSAS 18001 and QS 9000, Indian Quality standards, Benchmarking, Quality Audit, Quality Awards.

Suggested Readings

1. Mitra A., Fundamentals of Quality Control and Improvement, PHI, 2nd Ed., 1998.
2. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
3. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994
4. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.
5. D. C. Montgomery, Introduction to Statistical Quality Control, John Wiley & Sons, 3rd Edition.
6. J Evans and W Linsay, The Management and Control of Quality, 6'th Edition, Thomson, 2005
7. Besterfield, D H et al., Total Quality Management, 3rd Edition, Pearson Education, 2008.
8. D. C. Montgomery and G C Runger, Applied Statistics and Probability for Engineers, John Wiley & Sons, 4th Edition.

Course Outcomes & Bloom's Taxonomy

CO 1: Knowledge about the quality dimensions and its importance	K1(Remember) K2(Understand)
CO 2: Knowledge about the techniques of quality control and its importance for organizational competitiveness	K1(Remember) K2(Understand)
CO 3: Competency to analyze and impacts of Quality Control tools in the organization	K4(Analyse) K5(Evaluate) K6(Create)
CO 4: Understanding of the International and Indian Quality Control Standards	K1(Remember) K2(Understand)
CO 5: Competency to use statistical methods for process quality control	K1(Remember) K2(Understand) K3(Apply) K4(Analyse) K5(Evaluate)

SOURCING MANAGEMENT

Course Code : KMBOM04 Total Credit: 3 Teaching Hours : 36

Learning Objective: This course is designed to help the students to understand all aspects of sourcing and procurement management

Unit 1 (6 Lectures)

Sourcing Management: Introduction to Sourcing, Sourcing vs Procurement, Sourcing activities.**Purchasing:** Purchasing Cycle, Characteristics of a Purchasing Manager, Risks to be Considered by Purchase Manager. **Make or Buy Decision:** An introduction. **Case Studies**

Unit 2 (8 lectures)

Evaluating Suppliers' Efficiency: Vendor Rating, Selection and Development: Need for Measuring Supplier Performance, Categories of Suppliers, Supplier Evaluation and Selection Process, Vendor Rating process, Factors Affecting the Selection of Optimal Suppliers or Vendor Rating, Suppliers Evaluation Methods/ Vendor Rating Methods, Advantages of Vendor/Supplier Rating. **Case Studies**

Unit 3 **(7 Lectures)**

Vendor Process Capability and Material Handling: Introduction to Process Capability, Characteristics of Vendor Process Capability, Handling the Vendor Process Capability, Advantages of Vendor Process Capability. **Case Studies**

Unit 4 **(Lecture 7)**

Price Determination and Negotiation: Objectives of Pricing, Factors Influencing Pricing, Types of Pricing Strategies, **Negotiationinsourcing:**Meaning of Negotiation, Examples of Negotiation, Types of Negotiations, The Process of Negotiation, Skills for Successful Negotiating, and Obstacles to Negotiation. **Case Studies**

Unit 5 **(Lecture 8)**

Legal Aspect of Purchasing Management: An Introduction, The Indian Contract Act, 1872, GST, Law of Carriage of Goods. **Public Purchasing**: Procurement Process, Fundamental Principles of Public Buying; **Tendering:** Introduction, Terminologies used in Tendering, Tendering Process, e – Tendering. **Case Studies**

Suggested Readings

1. Dobler, D. W., jr, L. L., & Burt, D. N. (1995). Purchasing and Materials Management. New Delhi: Tata McGrawHil Publishing Company Limited
2. Gopalakrishnan P., Purchasing and Materials Management, Tata McGraw-Hill Publishing Company Ltd, New Delhi.
3. David N. Burt, Sheila Petcavage, Richard Pinkerton: Proactive Purchasing in the Supply Chain: The Key to World-Class Procurement, McGraw Hill

Course Outcomes & Bloom's Taxonomy

CO 1: Conceptual knowledge about the procurement and sourcing management	K1(Remember) K2(Understand)
CO 2: Understanding of the processes of sourcing management	K1(Remember) K2(Understand) K3(Apply) K4(Analyse)
CO 3: Competency to vendor selection and rating	K4(Analyse) K5(Evaluate)
CO 4: Assess the importance of effective sourcing	K4(Analyse) K5 (Evaluate)
CO 5: Understanding of laws of Procurements	K1(Remember) K2(Understand) K3(Apply)

MANAGEMENT OF MANUFACTURING SYSTEM

Code: KMBOM05 Total Credit: 3 Teaching Hours: 36

Learning Objective: This course is intended to provide a detail understanding of Manufacturing System and managerial aspects related to the management of manufacturing system

Unit 1 (6 Lectures)

Manufacturing System: Introduction and components, Importance of Manufacturing for Technological and Socioeconomic developments, Production versus Productivity; **Manufacturing Plant**: Decisions for Plant location. Plant Layouts and its types. **Types of manufacturing System:** Job shop. Mass, Batch, Project shop, Continuous process Linked cell system (Cellular manufacturing system), Flexible Manufacturing System (FMS)

Unit 2 (7 Lectures)

Manufacturing Support System: Process Planning, Computer Aided Process Planning, Production planning and Control Systems, Aggregate Planning and Master Production schedule, Material Requirement Planning, Capacity Planning ; **Shop Floor Control:** Introduction, Overview of Automatic Identification and Data capture , Bar Code Technology and Radio Frequency Identification

Unit 3 (7 Lectures)

Facility planning: Factors affecting selection of plant location, Factor rating analysis, Load distance model, closeness ratings. Types of plant layout, criteria for good layout, Process layout, Assembly line balancing. Computer based solutions to layout problems.

Unit 4 (8 Lectures)

Capacity planning: Analysis of designed capacity, installed capacity, commissioned capacity, utilized capacity, factors affecting productivity and capacity expansion strategies.

Unit 5 (8 lectures)

Maintenance System: Maintenance strategies and planning, **Maintenance economics**: quantitative analysis, optimal number of machines, Replacement strategies and policies, economic service life, opportunity cost, replacement analysis using specific time period, spares management. Maintenance records

Suggested Readings

1. Kalpakjian and Schmid, Manufacturing Engineering and Technology, 6 ed., Pearson.
2. Lindberg, Processes & Materials of Manufacture, Prentice Hall India.
3. J P Kaushik: Manufacturing Processes , PHI
4. James. B. Dilworth, "Operations Management – Design, Planning and Control for Manufacturing and Services", McGraw Hill Inc. Management Series, 1
5. P. Radhakrishnan, S. Subramanyan and V. Raju, "CAD / CAM / CIM", 2nd Edition, New Age Interational (Pvt.) Ltd. Publishers, 2003

Course Outcomes & Bloom's Taxonomy

CO 1: Conceptual knowledge working of Manufacturing unit and complete system	K1(Remember) K2(Understand)
CO 2: Understanding of the processes of and activities of Manufacturing	K1(Remember) K2(Understand) K3(Apply)
CO 3: Competency to implement effective managerial practices in manufacturing	K2(Understand) K3(Apply) K4(Analyse) K5(Evaluate)
CO 4: Understanding of tools for maintenance and capacity planning	K4(Analyse) K5 (Evaluate)

CO 5: Knowledge about the support systems of manufacturing	K1(Remember) K2(Understand)

Summer Training Project Report

At the end of the second semester examination, it is mandatory for every student of MBA to undergo on-the-job practical training in any manufacturing, service or financial organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.

2. During the training, the student is expected to learn about the organization and analyze and suggest solutions to a live problem. The objective is to equip the students with the knowledge of actual functioning of an organization and problems faced by them for exploring feasible solutions.

3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.

4. The student, after the completion of training will submit a report to the College/Institute which will form part of the third semester examination. However, the report must be submitted by the end of September 30.

5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should ordinarily be based on primary data. It should reflect in depth study of a micro problem, ordinarily assigned by the organization where the student undergoes training. Relevant tables and bibliography should support it. One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. This chapter will form part 1 of the report. Part 2 of the report will contain the study of micro research problem. The average size of report ordinarily will be of minimum 100 pages in standard font size (12) and double spacing. Two neatly typed (one sided only) and soft bound copies of the report will be submitted to the College/Institute. The report will be typed on A-4 size paper.

6. The report will have three certificates, one by the Head of the Department, another by the Faculty guide and third one from reporting officer of the organization where the student has undergone training. These three certificates should be attached in the beginning of the report.

7. The Summer Training Project Report will carry 150 marks and will be evaluated by two examiners (external and internal). The evaluation will consist of (1) Project Report evaluation (2) Project Presentation and Viva Voce.

The Project Report evaluation will comprise of 50 sessional marks and would be evaluated by internal project guide. The Presentation and Viva Voce would comprise of 100 marks and would be evaluated by two examiners (1 external and 1 internal). The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the awards given by the examiners is 30 or more marks, the project report will be referred to a third examiner. Only such person will evaluate the project report who has minimum three years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.

8. The parameters on which external evaluation would be carried out are as under:

Project Report Evaluation:

Evaluation Criteria	Understanding of Objectives with topic (20)	Understanding Of Reliance of topic (20)	Interpretation & Analysis (20)	Presentation (20)	Query handling (20)

9. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.

10. The student shall prepare the Summer Training Project Report as per the format given in the Summer Training Manual as prescribed by the University

Research Project Report (RPR)

In fourth semester, the candidates will have to submit a Research Project Report on a problem/topic (from the specialization areas) to be assigned by the MBA department under the supervision of a core faculty member of the department. The Research Project Report will carry 300 marks. The evaluation of the project report will be done by two examiners (external & internal). The evaluation will consist of (1) Evaluation of Project Report (2) Presentation and Viva Voce. The evaluation of Project Report will comprise of 50 marks and would be evaluated by the internal guide. The evaluation of Viva Voce of Project would comprise of 200 marks and would be evaluated by two examiners (1 external and 1 internal).The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the marks given by the examiners is 30 or more, the project report will be referred to a third examiner. In such cases the average of two closer awards (given by three examiners) will be taken into account for the results. The report will contain the objectives and scope of the study. Research Methodology, use and importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit two copies of the report to the Head of MBA program. The number of pages in the report will be minimum 75 or more. The report should be typed in A-4 size paper. The parameter on which both evaluation (1 & 2) would be carried on would be on the basis of:

The scheme of evaluation for Project Report

Criteria	Relevance of Objectives with topic (20)	Relevance of Research Methodology(40)	Interpretation & Analysis (40)	Total (100)

The scheme of evaluation of Viva voce

Evaluation Criteria	Understanding of Objectives with topic (40)	Understanding of the relevance of Research (40)	Interpretation & Analysis (40)	Presentation & Communication skills (40)	Query Handling (40)	Total (200)

The student shall prepare the Research Project Report as per the format given in the Research Project Report Manual as prescribed by the University.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS
2^{nd} Year

[Effective from Session 2014-15]

1. B.Tech. Electronics Engineering
2. B.Tech. Electronics & Communication Engineering
3. B.Tech. Electronics & Telecommunication Engineering
4. B.Tech. Electronics & Instrumentation Engineering
5. B.Tech. Instrumentation & Control Engineering
6. B. Tech. Applied Electronics and Control Engineering
7. B. Tech. Biomedical Engineering

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering
[Effective from Session 2014-15]

YEAR 2ND SEMESTER-III

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NAS-301/ NOE-031- NOE-039	Engg. Mathematics-III/Science based Electives*	3	1	0	30	20	50	100	150	4
2.	NEC-301	Network Analysis & Synthesis	3	1	0	30	20	50	100	150	4
3.	NEC-302	Fundamental of Electronic Devices	3	1	0	30	20	50	100	150	4
4.	NEC-303	Signals and Systems	3	1	0	30	20	50	100	150	4
5.	NHU-301/ NHU-302	Industrial Psychology/Industrial Sociology	2	0	0	15	10	25	50	75	2
6.	NEC-304	Switching Theory & Logic Design	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	Human Values & Professional Ethics/Cyber Security	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
7.	NEC-351	Network Analysis & Synthesis Lab.	0	0	3	10	10	20	30	50	1
8.	NEC-352	Electronics Workshop & PCB Design	0	0	3	10	10	20	30	50	1
9.	NEC-353	Logic Design Lab.	0	0	2	10	10	20	30	50	1
10.	NEC-354	Electronic Device Lab.	0	0	2	10	10	20	30	50	1
11.	NGP-301	NGP						50		50	--
		Total	18	5	10					1000	25

Science Based Open Elective:

NOE031 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE032 Nano Sciences
NOE033 Laser Systems and Applications
NOE034 Space Sciences
NOE035 Polymer Science & Technology
NOE036 Nuclear Science
NOE037 Material Science
NOE038 Discrete Mathematics
NOE039 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY AND EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering, B.Tech. Electronics & Instrumentation Engineering, B.Tech. Instrumentation & Control Engineering, B. Tech. Applied Electronics and Control Engineering, B. Tech. Biomedical Engineering

[Effective from Session 2014-15]

YEAR 2ND SEMESTER-IV

S.No.	Subject Code	Name of Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	CT	TA	Total	ESC		
1.	NOE-041-NOE-049/ NAS-401	Science based Elective/Engg. Mathematics-III	3	1	0	30	20	50	100	150	4
2.	NEC-401	Data Structure	3	1	0	30	20	50	100	150	4
3.	NEC-402	Electronic Circuits	3	1	0	30	20	50	100	150	4
4.	NEC-408	Electronic Measurements & Instrumentation	3	1	0	30	20	50	100	150	4
5.	NHU-401/ NHU-402	Industrial Sociology/ Industrial Psychology	2	0	0	15	10	25	50	75	2
6.	NEC-404	Electromagnetic Field Theory (EMFT)	2	1	0	15	10	25	50	75	3
7.	AUC-002/ AUC-001	Cyber Security/ Human Values & Professional Ethics	2	0	0	15	10	25	50	75**	--
PRACTICAL/DESIGN/DRAWING											
8.	NEC-451	Data Structure Lab.	0	0	3	10	10	20	30	50	1
9.	NEC-452	Electronic Circuits Lab.	0	0	3	10	10	20	30	50	1
10.	NEC-453	Digital Electronics Lab.	0	0	2	10	10	20	30	50	1
11.	NEC-454	Electronics Measurement Lab.	0	0	2	10	10	20	30	50	1
12.	NGP-401	NGP						50		50	--
		Total				40				1000	25

Science Based Open Elective:

NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm
NOE-042 Nano Sciences
NOE-043 Laser Systems and Applications
NoE-044 Space Sciences
NOE-045 Polymer Science & Technology
NOE-046 Nuclear Science
NOE-047 Material Science
NOE-048 Discrete Mathematics
NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

Syllabus Third semester

THEORY SUBJECTS

NEC-301 NETWORK ANALYSIS & SYNTHESIS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Signal analysis, complex frequency, network analysis, network synthesis, General characteristics and descriptions of signals, step function and associated wave forms, The unit impulse Introduction to network analysis, network elements, initial and final conditions, step and impulse response, solution of network equations,	1.1 to 1.4 2.1 to 2.3 5.1 to 5.5	10
II.	Review of Laplace transforms, poles and zeroes, initial and final value theorems, The transform circuit, Thevenin's and Norton's theorems, the system function, step and impulse responses, the convolution integral. Amplitude and phase responses. Network functions, relation between port parameters, transfer functions using two port parameters, interconnection of two ports.	7.1 to 7.5 8.1 9.1 to 9.4	8
III.	Hurwitz polynomials, positive real functions. Properties of real immittance functions, synthesis of LC driving point immittances, properties of RC driving point impedances, synthesis of RC impedances or RL admittances, properties of RL impedances and RC admittances.	10.2,10.3 11.1 to 11.5	8
IV.	Properties of transfer functions, zeroes of transmission, synthesis of Y21 and Z21 with 1Ω terminations.	12.1 to 12.3	6
V.	Introduction to active network synthesis Active Network Synthesis	Material available on UPTU website & 8.7 (Text Book 2)	8

Text Book:
1. Franklin F. Kuo, "Network Analysis and synthesis", 2nd Edition, Wiley India Pvt Ltd.
2. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.

Reference Books: M. E. Van Valkenberg, "Network Analysis", 2nd Edition, Prentice Hall of India Ltd.
Ghosh-Network Theory: Analysis and Synthesis, PHI Learning Pvt. Ltd

NEC-302 FUNDAMENTAL OF ELECTRONIC DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Crystal Properties and charge Carriers in Semiconductors: Elemental and compound semiconductor materials, crystal lattice structure, Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.	1.1 to 1.2 3.1 to 3.4	8
II.	Excess Carriers in Semiconductors: Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.	4.1 to 4.3 and 4.4.1 to 4.4.4	8
III.	Junction Properties: Equilibrium conditions, biased junctions, steady state conditions, reverse bias break down, transient and AC conditions. Metal semiconductor junctions.	5.2 to 5.5 5.7	8
IV.	Transistors: Metal-semiconductor-field-effect-transistors (MESFET), Metal-insulator-semiconductor-field-effect-transistors (MISFET), Metal oxide semiconductor field effect transistor (MOSFET): Construction, Operation and characteristics of above devices. Bipolar junction transistors: Fundamentals of BJT operation, amplification with BJTs	6.3.1 to 6.3.2, 6.4.1 to 6.4.2, 6.5.1 to 6.5.2 7.1 to 7.2	8
V.	Some special devices: Photodiodes, photo detectors, solar cell, light emitting diodes, semi-conductor lasers, light emitting materials. Tunnel Diode: degenerate semiconductors, IMPATT diode; The transferred electron mechanism: The GUNN diode. P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices: DIAC, TRIAC, IGBT.	8.1, 8.2.1, 8.2.3, 8.3, 8.4; 10.1 10.2 10.3.1, 10.3.2 11.1 to 11.3	8
Text Book: B. G. Streetman and S. Banerjee "Solid state electronics devices", 5th Edition, PHI.			
Reference Books:1. Alok Dutta, "Semiconductor Devices and circuits", Oxford University Press. 2. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.			

NEC-303 SIGNALS AND SYSTEMS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Signals**: Definition, types of signals and their representations: continuous-time/discrete-time, periodic/non-periodic, even/odd, energy/power, deterministic/ random, one-dimensional/ multidimensional; commonly used signals (in continuous-time as well as in discrete-time): unit impulse, unit step, unit ramp (and their interrelationships), exponential, rectangular pulse, sinusoidal; operations on continuous-time and discrete-time signals (including transformations of independent variables).	1.1 to 1.5	6
II.	**Laplace-Transform (LT) and Z-transform (ZT):** (i) One-sided LT of some common signals, important theorems and properties of LT, inverse LT, solutions of differential equations using LT, Bilateral LT, Regions of convergence (ROC) (ii) One sided and Bilateral Z-transforms, ZT of some common signals, ROC, Properties and theorems, solution of difference equations using one-sided ZT, s- to z-plane mapping	2.1 to 2.15	3+5
III.	**Fourier Transforms (FT):** (i) Definition, conditions of existence of FT, properties, magnitude and phase spectra, Some important FT theorems, Parseval's theorem, Inverse FT, relation between LT and FT (ii) Discrete time Fourier transform (DTFT), inverse DTFT, convergence, properties and theorems, Comparison between continuous time FT and DTFT	4.1 4.11; 5.1 to 5.7	6+4
IV.	**Systems**: Classification, linearity, time-invariance and causality, impulse response, characterization of linear time-invariant (LTI) systems, unit sample response, convolution summation, step response of discrete time systems, stability. Convolution integral, co-relations, signal energy and energy spectral density, signal power and power spectral density, properties of power spectral density,	7.1 to 7.12; 9.2, 9.6 to 9.8	8
V.	**Time and frequency domain analysis of systems** Analysis of first order and second order systems, continuous-time (CT) system analysis using LT, system functions of CT systems, poles and zeros, block diagram representations; discrete-time system functions, block diagram representation, illustration of the concepts of system bandwidth and rise time through the analysis of a first order CT low pass filter	8.1-8.6; 8.8	10
Text Book: P. Ramakrishna Rao, 'Signal and Systems' 2008 Ed., Tata McGraw Hill, New Delhi			
Reference Books: Chi-Tsong Chen, 'Signals and Systems', 3rd Ed., Oxford University Press, 2004 V. Oppenheim, A.S. Willsky & S. Hamid Nawab, 'Signals & System', Pearson Education, 2nd Ed., 2003.			

NEC-304 SWITCHING THEORY AND LOGIC DESIGN			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Digital system and binary numbers: Signed binary numbers, binary codes. Gate-level minimization: The map method up to four variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).	1.6, 1.7, 7.4 3.1 to 3.7, 3.10	5
II.	Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers	4.1 to 4.11	8
III.	Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure. Asynchronous Sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.	5.1 to 5.5, 5.7 to 5.8 9.1 to 9.7	9
IV.	Registers and counters: Shift registers, ripple counter, synchronous Counter, other counters. Memory and programmable logic: RAM, ROM, PLA, PAL.	6.1 to 6.5 7.1 to 7.3, 7.5to 7.7	8
Text Book: M. Morris Mano and M. D. Ciletti, "Digital Design", 4th Edition, Pearson Education			
Reference Books: 1. Hill & Peterson, "Switching Circuit & Logic Design", Wiley. 2. Mohammad A. Karim and Xinghao Chen, "Digital Design-Basic concepts and Principles", CRC Press Taylor & Francis group, 2010.			

LABORATORY

NEC- 351 NETWORK ANALYSIS & SYNTHESIS LAB

1. Study and verification of network theorems with input signal of 1 kHz, 10kHz and 100kHz.
2. Verification of two port network parameters
3. Step and Ramp response of series and parallel RC circuits
4. Verification of properties of RC circuits
5. Verification of properties of RL circuits
6. Verification of properties of LC circuits
7. Verification of inverting, non-inverting and voltage follower VCVS circuits using 741 op-amp
8. Verification of inverting integrator using 741 op-amp
9. Design a finite gain differential amplifier with infinite input impedance and verify the output response.

NEC- 352 ELECTRONIC WORKSHOP & PCB LAB

Objective: To create interest in Hardware Technology.

1. Study of CRO, DMM & Function Generator
2. Identification of Active & Passive Components
3. Winding shop: Step down transformer winding of less than 5VA.
4. Soldering shop: Fabrication of DC regulated power supply
5. PCB Lab: (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB.
6. Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
7. Testing of regulated power supply fabricated.

NEC- 353 LOGIC DESIGN LAB

Objective: To understand the digital logic and create various systems by using these logics.

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of V_{cc} and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder/De-multiplexer and Encoder using logic gates.
5. Implementation of 4x1 multiplexer using logic gates.
6. Implementation of 4-bit parallel adder using 7483 IC.
7. Design, and verify the 4-bit synchronous counter.
8. Design, and verify the 4-bit asynchronous counter.
9. Mini Project (Imp)

NEC- 354 ELECTRONIC DEVICES LAB.

Objective: To attain expertise in lab equipment handling and understanding the basic devices, their properties, Characteristics in detail. Along with their practical usage in the circuit

1. **Study of lab equipments and components:** CRO, Multimeter, Function Generator, Power supply- Active, Passive Components & Bread Board.
2. **P-N Junction Diode**: Characteristics of PN Junction diode-Static and dynamic resistance measurement from graph.
3. **Applications of PN junction diode**: Half & Full wave rectifier- Measurement of Vrms, Vdc, and ripple factor-use of filter- ripple reduction (RC Filter)-Clipper & Clamper
4. **Properties of junctions** Zener diode characteristics. Heavy doping alters the reverse characteristics. Graphical measurement of forward and reverse resistance.
5. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
6. **Characteristic of BJT**: BJT in CB and CE configuration- Graphical measurement of h parameters from input and output characteristics. Measurement of Av, AI, Ro and Ri of CE amplifier with potential divider biasing.
7. **Characteristic of FET**: FET in common source configuration. Graphical measurement of its parameters gm, rd & m from input and output characteristics.
8. **Characteristic** of silicon-controlled rectifier.
9. **To plot** V-I Characteristics of DIAC.
10. **To draw** V-I characteristics of TRIAC for different values of Gate Currents.

Syllabus fourth semester

THEORY SUBJECTS

NEC-401 DATA STRUCTURE		3 1 0
Unit	Topic	Proposed number of Lectures
I.	Introduction: Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List	8
II.	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	8
III.	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In order, Preorder and Post order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.	8
IV.	Graphs: Terminology, Sequential and linked Representations of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal : Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transistive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks	8
V.	Searching : Sequential search, Binary Search, Comparison and Analysis Internal Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort	8

Text book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data Structures Using C and C++” , PHI

References

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication
2. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill
3. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education
4. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH
5. G A V Pai, “Data Structures and Algorithms”, TMH

NEC-402 ELECTRONIC CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	**Operational Amplifier:** Inverting and non-inverting configurations, difference amplifier, Effect of finite open loop gain and bandwidth on circuit performance, Large signal operation of op-amp.	2.2 to 2.6	8
II.	**MOSFET:** Review of device structure operation and V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier	4.3 to 4.9 and 4.11	8
III.	**BJT:** Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.	5.3 to 5.9	8
IV.	**Differential Amplifier:** MOS differential pair, small signal operation of the MOS differential pair, BJT differential pair, other non-ideal characteristic of the Differential amplifier (DA), DA with active load.	7.1 to 7.5	9
V.	**Feedback:** The general feedback structure, properties of negative feed back, the four basic feedback topologies, the series-shunt feedback amplifier, the series-series feedback amplifier, the shunt-shunt and shunt-series feedback amplifier. **Oscillators:** Basic principles of sinusoidal oscillators, op-amp RC oscillator circuits, LC oscillator.	8.1 to 8.6 13.1 to 13.3	7
Text Book: A. S. Sedra and K. C. Smith, "Microelectronic Circuits", Oxford University Press, 5th Ed.			
Reference Books: Jacob Millman and Arvin Grabel, "Microelectronics", 2nd Ed TMH			

NEC-403 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Unit, dimensions and standards: Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter.	1.1 to 1.7 2.1 to 2.5 3.1 to 3.4	8
II.	Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, probes Digital voltmeter systems, digital multimeters, digital frequency meter system	4.1, 4.2, 4.4, 4.5, 4.7 6.1 to 6.3	8
III.	Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	7.1, 7.3, 7.4,7.5 8.2 to 8.4, 8.9	8
IV.	CRO: CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO applications	9.1, 9.3, 9.4,9.5, 9.7, 9.9, 9.12,10.1, 10.3,10.4, 10.5	8
V.	Instrument calibration: Comparison method, digital multimeters as standard instrument, calibration instrument Recorders: X-Y recorders, plotters	12.1, 12.2 ,12.3, 13.2, 13.4	8
Text Book: David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008.			
Reference Books: Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008.			

NEC-404 ELECTROMAGNETIC FIELD THEORY			2 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I.	Coordinate systems and transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	2.1 to 2.4 3.1 to 3.8	6
II.	Electrostatics: Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Electrostatic boundary value problems: Poission's and Laplace's equations, general procedures for soling Poission's or Laplace's equations, resistance and capacitance, method of images.	to 4.9 5.1 to 5.6, 5.8, 5.9 6.1, 6.2, 6.4 to 6.6	10
III.	Magnetostatics: Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	7.1 to 7.7 8.1 to 8.9	8
IV.	Waves and applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, displacement current, Maxwell's equation in final form. Electromagnetic wave propagation: Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	9.1 to 9.5 10.1, 10.3 to 10.8	8
Text Book: M. N. O. Sadiku, "Elements of Electromagnetics", 4th , Ed, Oxford University Press.			
Reference Books: W. H. Hayt and J. A. Buck, "Electromagnetic field theory", 7th Ed., TMH. Pramanik-Electromagnetism: Vol.1-Theory, PHI Learning Pvt. Ltd			

LABOROTARY

NEC- 451 DATA STRUCTURE LAB

Program in C or C++ for following:

1. To implement addition and multiplication of two 2D arrays.
2. To transpose a 2D array.
3. To implement stack using array.
4. To implement queue using array.
5. To implement circular queue using array.
6. To implement stack using linked list.
7. To implement queue using linked list.
8. To implement circular queue using linked list.
9. To implement binary tree using linked list.
10. To implement binary search tree using linked list.
11. To implement tree traversals using linked list.
12. To implement BFS using linked list.
13. To implement DFS using linked list.
14. To implement Linear Search.
15. To implement Binary Search.
16. To implement Bubble Sorting.
17. To implement Selection Sorting.
18. To implement Insertion Sorting.
19. To implement Merge Sorting.
20. To implement Heap Sorting.

NEC- 452 ELECTRONIC CIRCUITS LAB

Objective - To design and implement the circuits to gain knowledge on performance of the circuits and its applications.

Measurement of Operational Amplifier Parameters-Common Mode Gain, Differential Mode Gain, CMRR, Slew Rate.

Applications of Op-amp- Op-amp as summing amplifier, Difference amplifier, Integrator and differentiator

Field Effect Transistors-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, Measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier

Bipolar Transistors- Design of single stage RC coupled amplifier –design of DC biasing circuit using potential divider arrangement –Plot of frequency versus gain in dB. Measurement of bandwidth of an amplifier, input impedance and Maximum Signal Handling Capacity of an amplifier.

Two stage Amplifier. Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier

Common Collector Configuration-Emitter Follower (using Darlington pair)-Gain and input impedance measurement of the circuit.

Power Amplifiers-Push pull amplifier in class B mode of operation –measurement of gain.

Differential Amplifier –Implementation of transistor differential amplifier .Non ideal characteristics of differential amplifier

Oscillators -Sinusoidal Oscillators- (a) Wein bridge oscillator (b) phase shift oscillator

Simulation of Amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

NEC- 453 DIGITAL ELECTRONIC LAB

1. TTL Transfer Characteristics and TTL IC Gates.
2. CMOS Gate Transfer Characteristics.
3. Implementation of a 3-bit SIPO and SISO shift registers using flip-flops.
4. Implementation of a 3-bit PIPO and PISO shift registers using flip-flops.
5. Design of Seven segment display driver for BCD codes.
6. BCD Adders & Subtractors
7. A L U
8. 8085 Assembly Language Programming

NEC- 454 ELECTRONIC MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 trans (ii) J- type trans. (iii) K-type trans (iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin’s double bridge.
8. Radio Receiver Measurements

PROPOSED STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING

Semester I

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Norms	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NEC-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	ELECTRICAL ENGG Subject Code/ Name	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-603 Special Electrical Machines	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-011-NEE-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEE-021-NEE-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651 Power System Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEE-652 Electrical CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE 701 FACTS	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-703 Power Station Practice	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEE-031 NEE-034 Departmental Elective-III	Departmental Elective -III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-751 Drives Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEE-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEE-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit	
			L	T	P	Sessional Assessment			ESE			
						CT	TA	Total				
THEORY SUBJECT												
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4	
2	NEE 801 Utilization Of Electrical Energy & Traction	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2	
3	NEE 041 – NEE 044 Departmental Elective -IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4	
4	NEC-809 Communication Engg	Departmental Elective -V	3	1	0	30	20	50	100	150	4	
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2	
PRACTICAL/DESIGN/DRAWING												
6	NEE 851 Project	Project			12		100	100	250	350	8	
7		GP						50		50		
8		TOTAL	13	5	12					1000	24	

PROPOSED STUDY AND EVELUATION SCHEME OF

ELECTRICAL & ELECTRONICS ENGINEERING

Semester I

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Norms	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NECN-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEN 603 / EEC 501 Integrated Circuits	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN-011-NEN-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEN 021-NEN-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEC 651 IC Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEN-652 Electronics CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEN-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEN 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEN 701 Analog & Digital Communication	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN 702 Digital Signal Processing	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEN-031 NEN-034 Departmental Elective-III	Departmental Elective - III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEN-751 Digital Signal Processing Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEN-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEN-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4
2	NEC 801 Data Communication Networks	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2
3	NEN 041 – NEN 044 Departmental Elective - IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4
4	NEN 051 – NEN 054 Departmental Elective - V	Departmental Elective -V	3	1	0	30	20	50	100	150	4
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
6	NEN 851 Project	Project			12		100	100	250	350	8
7		GP						50		50	
8		TOTAL	13	5	12					1000	24

NEE – 301: ELECTRO-MECHANICAL ENERGY CONVERSION –I

L T P 3 1 0

Unit – I

Principles of Electro-mechanical Energy Conversion- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque , Generated emf in machines; Torque in machines with cylindrical air gap. (7)

Unit – II

D.C. Machines- Construction of DC Machines, Armature winding, Emf and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C. generators. (9)

Unit –III

D.C. Machines (Contd.)- Performance characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test). (8)

Unit – IV

Single Phase Transformer- Phasor diagram, Efficiency and voltage regulation, All day efficiency.

Testing of Transformers- O.C. and S.C. tests, Sumpner's test, Polarity test.

Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits & demerits and applications. (8)

Unit – V

Three Phase Transformers - Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.(9)

Text Books:

1 I.J. Nagrath & D.P.Kothari, " Electrical Machines", Tata McGraw Hill

2 Husain Ashfaq , " Electrical Machines", Dhanpat Rai & Sons

3 P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

4. A.E. Fitggerald, C.Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

5 Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.

6 M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.

7 P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers

NEE-302: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L T P 3 1 0

UNIT I

(1) Philosophy of Measurement- Methods of measurement, Measurement system**,** Classification of instrument systems, Characteristics of instruments & measurement systems**,** Errors in measurement & its analysis, Standards. (4)

(2) Analog Measurement of Electrical Quantities- Electrodynamic, Thermocouple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynamic wattmeter, Three Phase wattmeter, Power in three phase systems, Errors & remedies in wattmeter and energy meter. (5)

UNIT II

Instrument Transformers:CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (8)

UNIT III

Measurement of Parameters- Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Q meter. (9)

UNIT IV

(1) AC Potentiometers- Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. (4)

(2) Magnetic Measurement- Ballistic galvanometer, Flux meter**,** Determination of hysteresis loop, measurement of iron losses**.** (4)

UNIT V

(1) Digital Measurement of Electrical Quantities- Concept of digital measurement, Block diagram, Study of digital voltmeter, Frequency meter, *Spectrum analyzer*, Electronic multimeter. (3)

(2) Cathode Ray Oscilloscope- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components**,** Applications of CRO in measurement, Lissajous Pattern, Dual trace & dual beam oscilloscopes. (3)

Text Book:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement &Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH

Reference Books:

4. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
5. M. B. Stout , "Basic Electrical Measurement", Prentice Hall of India
6. W. D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
7. J. B. Gupta, "Electrical Measurement & Measuring Instrument", S. K. Kataria & Sons

NEE-303- BASIC SYSTEM ANALYSIS
L T P 3 1 0

UNIT I

Introduction to Continuous Time Signals and Systems- Basic continuous time signals, Unit step, Unit ramp, Unit impulse and periodic signals with their mathematical representation and characteristics. *Inversion, Shifting and Scaling of signals,* Introduction to various types of systems, *Causal, Stable, Linear and Time invariant systems.*

Analogous System- Linear mechanical elements, Force-voltage and force-current analogy, Modeling of mechanical and electro-mechanical systems. (9)

UNIT II

Fourier Transform Analysis- Exponential form and *compact* trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis. (8)

UNIT III

Laplace Transform- Review of Laplace Transform, Initial and Final Value theorems, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to analysis of networks, Waveform synthesis and Laplace Transform of complex waveforms. (8)

UNIT IV

State – Variable Analysis- Introduction, State Space representation of linear systems, Transfer Function and State Variables, State Transition Matrix, Solution of State Equations for homogeneous and non-homogeneous systems, Applications of State-Variable technique to the analysis of linear systems. (8)

UNIT IV

Z-Transform Analysis- Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function. (7)

Text Books:

1. Oppenhiem, Wilsky, Nawab, “Signals & Systems”, PHI
2. M E Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
3. A. Anand Kumar, “ Signals & Systems”, PHI
4. Choudhary D. Roy, “Network & Systems”, Wiley Eastern Ltd.

Reference Books:

5. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
6. Donald E. Scott, “Introduction to circuit Analysis” Mc. Graw Hill
7. B. P. Lathi, “Linear Systems & Signals” Oxford University Press, 2008.
8. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, “Singnals and Systems”, Tata Mc. Graw Hill, 2001.
9. Taan S. Elali & Mohd. A. Karim, “Continuous Signals and Systems with MATLAB” 2nd Edition, CRC Press.

NEE-401: ELECTRO-MECHANICAL ENERGY CONVERSION - II
L T P 3 1 0

UNIT - I

Synchronous Machine I - Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient. (9)

UNIT - II

Synchronous Machine II - Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor - Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser. (8)

UNIT - III

Three phase Induction Machine – I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque- slip characteristics, No load & blocked rotor tests, Efficiency, Induction generator & its applications. (9)

UNIT - IV

Three phase Induction Machine- II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit). (8)

UNIT - V

Single phase Induction Motor - Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor.

AC Commutator Motors - Universal motor, Single phase a.c. series compensated motor, Stepper motors. (8)

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain "Electric Machines", Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans "Electric Machinery", MC Graw Hill.
4. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers
6. M.G.Say, "Alternating Current Machines", Pitman & Sons

NEE- 402 NETWORK ANALYSIS AND SYNTHESIS
L T P 3 1 0

Unit – I

Graph Theory- Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analyses. (7)

Unit – II:

Network Theorems (Applications to AC Networks)- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem. (8)

Unit – III

Transient Circuit Analysis- Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. (7)

Unit – IV

Network Functions- *Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.* (3)

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation. (8)

Unit – V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (5)

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters. (4)

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. C. L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill
3. M. E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T. S. K. V. Iyer, "Circuit Theory", Tata McGraw Hill
5. Joseph A. Edminister, " Theory & Problems of Electric Circuits", McGraw Hill

NEE – 403: ELECTRICAL INSTRUMENTATION AND PROCESS CONTROL

L T P 2 1 0

Unit-I

Transducer – I

Definition, Advantages of electrical transducers, Classification, Characteristics, Factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT (7)

Unit-II

Transducer – II

Capacitive, Piezoelectric, Hall effect and Opto electronic transducers. Measurement of motion, force, pressure, temperature, flow and liquid level. (6)

Unit-III

Telemetry

General telemetry system, Land line & radio frequency telemetering systems, Transmission channels and media, Data receiver & transmitter.

Acquisition System

Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV

Display Devices and Recorders

Display devices, Storage oscilloscope, Spectrum analyzer, Strip chart & X-Y recorders, Magnetic tape & digital tape recorders.

Process Control

Principle, Elements of process control system, Process characteristics, Electronic, pneumatic & digital controllers. (7)

Text Books:

1. A. K. Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons
2. B.C. Nakra & K.Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, “Process Control Instrumentation Technology”, Prentice Hall

Reference Books:

4. E. O. Decblin, “Measurement System – Application & design”, Mc Graw Hill.
5. W. D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International
6. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI Learning.

NEE 409 ELECTRICAL MACHINES & AUTOMATIC CONTROL

L T P 3 1 0

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.
Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt- Amp relations, Efficiency, Advantages & Disadvantages, Applications.
D.C. Motors: Concept of starting, Speed control, Losses and Efficiency *(simple numericals only)*

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque- slip characteristics, Speed control *(simple numericals only)*.
Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. *(simple numericals only)*
Synchronous Motor *(conceptual treatment only)*: Starting, Effect of excitation on line current (V-curves), Synchronous condenser.
Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force- current analogy, Electrical analog of simple mechanical systems; Concept of transfer function & its determination for simple systems.
Control System: Open loop & closed loop controls systems; advantages and disadvantages.
Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.
Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, Limitations (*simple numerical only*); *Only conceptual treatment of* Polar plot, Nyquist stability criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and Phase margin and their determination.
Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text Book:

1. I. J. Nagrath & D. P. Kothari, "Electrical machines", Tata McGraw Hill.
2. P.S.Bimbhra, "Electrical Machinery", Khanna Publishers
3. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
4. Ghosh, "Control Systems: Theory and Applications", Pearson

Reference Books:

5. B.C. Kuo, "Automatic Control systems", Wiley India Ltd.
6. D. Roy Choudhary, "Modern Control Engineering" Prentice Hall of India.
7. M. Gopal, "Control Systems: Principles and Design" Tata McGraw Hill.

NEE – 459 : ELECTRICAL MACHINES & AUTOMATIC CONTROL LAB

L T P 0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System [Out of total 10, at least 04 experiments should be Simulation based]

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an AC 2-phase servo motor.
4. To study dc servo position control system within P and PI configurations.
6. To study Synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

NEE-351: ELECTROMECHANICAL ENERGY CONVERSION- I LAB

L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1 To obtain magnetization characteristics of a d.c. shunt generator.
2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3 To obtain efficiency of a dc shunt machine using Swinburn's test.
4 To perform Hopkinson's test and determine losses and efficiency of DC machine.
5 To obtain speed-torque characteristics of a dc shunt motor.
6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/Static Ward –Leonard method.
8 To study polarity and ratio test of single phase and 3-phase transformers.
9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11 To obtain 3-phase to 2-phase conversion by Scott connection.
12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

College may add any two S/W based experiments in the above list.

NEE-352: ELECTRICAL MEASUREMENT LAB

L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin's double bridge.
6. Measurement of voltage, current and resistance using dc potentiometer.
7. Measurement of inductance by Maxwell's bridge.
8. Measurement of inductance by Hay's bridge.
9. Measurement of inductance by Anderson's bridge.
10. Measurement of capacitance by Owen's bridge.
11. Measurement of capacitance by De Sauty bridge.
12. Measurement of capacitance by Schering bridge.
13. Study of frequency and differential time counter.

College may add any two experiments in the above list.

NEE-353: NUMERICAL TECHNIQUE LAB

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list:

S/W Based Experiments using MATLAB or Equivalent software.

1. Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
6. Solution of differential equations using 4th order Runge-Kutta method.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.
9. Determination of time response of an R-L-C circuit.

College may add any three experiments in the above list.

NEE- 451: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY
L T P 0 0 3

Note: Minimum eight experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method.

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

NEE-452: NETWORK LABORATORY

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.
11. Determination of frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.

College may add any three S/W based experiments in the above list.

NEE – 453: ELECTRICAL INSTRUMENTATION LAB.

L T P 0 0 2

Minimum eight experiments are to be performed from the following list.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer

College may add any three S/W based experiments in the above list.

NEE-454 ELECTRONICS LAB

L T P 0 0 2

ANALOG ELECTRONICS:

Note: Select at least any four out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any four out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

PROPOSED STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING

Semester I

S. No.	ELECTRICAL ENGG Subject Code/ Name	Norms	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NEC-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-603 Special Electrical Machines	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-011-NEE-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEE-021-NEE-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651 Power System Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEE-652 Electrical CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE 701 FACTS	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-703 Power Station Practice	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEE-031 NEE-034 Departmental Elective-III	Departmental Elective - III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-751 Drives Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEE-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEE-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit	
			L	T	P	Sessional Assessment			ESE			
						CT	TA	Total				
THEORY SUBJECT												
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4	
2	NEE 801 Utilization Of Electrical Energy & Traction	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2	
3	NEE 041 – NEE 044 Departmental Elective -IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4	
4	NEC-809 Communication Engg	Departmental Elective -V	3	1	0	30	20	50	100	150	4	
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2	
PRACTICAL/DESIGN/DRAWING												
6	NEE 851 Project	Project			12		100	100	250	350	8	
7		GP						50		50		
8		TOTAL	13	5	12					1000	24	

PROPOSED STUDY AND EVELUATION SCHEME OF

ELECTRICAL & ELECTRONICS ENGINEERING

Semester I

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Norms	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-I	3	1	0	30	20	50	100	150	4
2		Basic Electronics Engg./ Professional Communication	3	1	0	30	20	50	100	150	4
3		Engg. Chemistry/Engg. Mechanics	3	1	0	30	20	50	100	150	4
4	NEE 101- Electrical Engineering	Basic Electrical Engg./Fundamentals of Computer Programming	3	1	0	30	20	50	100	150	4
5		Engg. Physics-I	2	1	0	15	10	25	50	75	3
6		Basic Manufacturing Processes/Environment & Ecology	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Chemistry Lab/ Engg. Mechanics Lab	0	0	2	10	10	20	30	50	1
8	NEE 101- Electrical Engineering Lab	Basic Electrical Engg. Lab/ Computer Programming Lab	0	0	2	10	10	20	30	50	1
9		Workshop Practice/ Computer Aided Engg. Graphics	0	1	3	10	10	20	30	50	2
10		Engg. Physics Lab/ Professional Communication Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-II

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1		Engg. Mathematics-II	3	1	0	30	20	50	100	150	4
2		Professional Communication/ Basic Electronics Engg.	3	1	0	30	20	50	100	150	4
3		Engg. Mechanics/ Engg. Chemistry	3	1	0	30	20	50	100	150	4
4	NEE 201- Electrical Engineering	Fundamentals of Computer Programming/Basic Electrical Engg.	3	1	0	30	20	50	100	150	4
5		Engg. Physics-II	2	1	0	15	10	25	50	75	3
6		Environment & Ecology/Basic Manufacturing Processes	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7		Engg. Mechanics Lab/ Engg. Chemistry Lab	0	0	2	10	10	20	30	50	1
8	NEE 251- Electrical Engineering Lab	Computer Programming Lab/ Basic Electrical Engg. Lab	0	0	2	10	10	20	30	50	1
9		Computer Aided Engg. Graphics/ Workshop Practice	0	1	3	10	10	20	30	50	2
10		Professional Communication Lab/ Engg. Physics Lab	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	6	9					1000	26

Semester-III

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/NOE-031/NOE-038	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NME-309 Thermal & Hydraulic Machines	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-301 EMEC-I	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-302 Elect Measurement & Measuring Instruments	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-301/NHU-302 Industrial Psychology/Industrial sociology	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NEE-303 Basic System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
8	NEE-351 EMEC-I Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-352 EMMI Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-353 Numerical Technique Lab	Departmental Subject (Core)	0	0	2	5	5	10	15	25	1
11		GP						50		50	
		TOTAL	17	5	07					1000	25

Semester-IV

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-041-NOE-048/NAS-401 Science Based Open Elective/Mathematics III	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NEC- 409 Analog & Digital Electronics	Engg. Subject (from other dept.)	3	1	0	30	20	50	100	150	4
3	NEE-401 EMEC-II	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-402 Network Analysis and Synthesis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NHU-402/NHU-401 Industrial Sociology/Industrial Psychology	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NEE-403 Instrumentation & Process Control	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
PRACTICAL/DESIGN/DRAWING											
7	NECN-459 Electronics Lab	Engg. Subject (from other dept.)	0	0	3	10	10	20	30	50	1
8	NEE-451 EMEC-II Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-452 Network Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE-453 Instrumentation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-V

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-501 Elements Of Power System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 502 Power Electronics	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEE-503 Control System	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEE-504 Microprocessor & Its Applications	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEC-508 Fundamentals of E.M.Theory	Departmental Subject (Core)	2	1	0	15	10	25	50	75	3
6	NHU-501 Engineering & Managerial Economics	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551 Power Electronics Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
8	NEE 552 Control System Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEE-553 Microprocessor Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEE 554 Advanced Simulation Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VI

S. No.	ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-601 Power System Analysis	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
2	NEE 602 Switchgear & Protection	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
3	NEN 603 / EEC 501 Integrated Circuits	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN-011-NEN-014 Departmental Elective-I	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEN 021-NEN-024 Departmental Elective-II	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	EHU-601 Industrial Management	HS	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEC 651 IC Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
8	NEN-652 Electronics CAD Lab	Departmental Subject (Core)	0	0	3	10	10	20	30	50	1
9	NEN-653 Minor Project	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
10	NEN 654 Seminar	Seminar	0	0	3		50	50		50	1
11		GP						50		50	
		TOTAL	16	5	10					1000	25

Semester-VII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEN 701 Analog & Digital Communication	Open Elective from other departments	2	0	0	15	10	25	50	75	2
2	NOE 071-O74 Open Elective-I	Open Elective from other departments	3	1	0	30	20	50	100	150	4
3	NEE-702 Electric Drives	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
4	NEN 702 Digital Signal Processing	Departmental Subject (Core)	3	1	0	30	20	50	100	150	4
5	NEN-031 NEN-034 Departmental Elective-III	Departmental Elective - III	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEN-751 Digital Signal Processing Lab	Departmental Subject (Core)	0	0	2	10	10	20	30	50	1
6	NEN-752 Industrial Training	Industrial Trg.	0	0	3		75	75		75	2
7	NEN-753 Project	Project	0	0	8		150	150		150	4
8		GP						50		50	
		TOTAL	14	4	13					1000	25

Semester-VIII

S. No.	**ELECTRICAL & ELECTRONICS ENGG Subject Code/ Name**	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 NOE-084 Open Elective-II	Open Elective from other departments	3	1	0	30	20	50	100	150	4
2	NEC 801 Data Communication Networks	Departmental Subject (Core)	2	1	0	15	10	25	50	75	2
3	NEN 041 – NEN 044 Departmental Elective - IV	Departmental Elective -IV	3	1	0	30	20	50	100	150	4
4	NEN 051 – NEN 054 Departmental Elective - V	Departmental Elective -V	3	1	0	30	20	50	100	150	4
5	NEE 803 Elect Engg Materials		2	1	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
6	NEN 851 Project	Project			12		100	100	250	350	8
7		GP						50		50	
8		TOTAL	13	5	12					1000	24

NEE – 301: ELECTRO-MECHANICAL ENERGY CONVERSION –I
L T P 3 1 0

Unit – I

Principles of Electro-mechanical Energy Conversion- Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy & Co-energy), Singly excited systems; Determination of mechanical force, Mechanical energy, Torque equation, Doubly excited Systems; Energy stored in magnetic field, Electromagnetic torque , Generated emf in machines; Torque in machines with cylindrical air gap. (7)

Unit – II

D.C. Machines- Construction of DC Machines, Armature winding, Emf and torque equations, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of D.C. generators. (9)

Unit –III

D.C. Machines (Contd.)- Performance characteristics of D.C. motors, Starting of D.C. motors; 3 point and 4 point starters, Speed control of D.C. motors; Field control, Armature control and Voltage control (Ward Lenonard method); Efficiency and Testing of D.C. machines (Hopkinson's and Swinburn's Test). (8)

Unit – IV

Single Phase Transformer- Phasor diagram, Efficiency and voltage regulation, All day efficiency.

Testing of Transformers- O.C. and S.C. tests, Sumpner's test, Polarity test.

Auto Transformer- Single phase and three phase auto transformers, Volt-amp relation, Efficiency, Merits & demerits and applications. (8)

Unit – V

Three Phase Transformers - Construction, Three phase transformer, Phasor groups and their connections, Open delta connection, Three phase to 2 phase, 6 phase or 12 phase connections and their applications, Parallel operation of single phase and three phase transformers and load sharing, Excitation phenomenon and harmonics in transformers, Three winding transformers.(9)

Text Books:

1 I.J. Nagrath & D.P.Kothari, " Electrical Machines", Tata McGraw Hill

2 Husain Ashfaq , " Electrical Machines", Dhanpat Rai & Sons

3 P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

4. A.E. Fitggerald, C.Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

5 Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.

6 M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.

7 P.S. Bimbhra, " Generalized Theory of Electrical Machines", Khanna Publishers

NEE-302: ELECTRICAL MEASUREMENT & MEASURING INSTRUMENTS

L T P 3 1 0

UNIT I

(1) Philosophy of Measurement- Methods of measurement, Measurement system**,** Classification of instrument systems, Characteristics of instruments & measurement systems**,** Errors in measurement & its analysis, Standards. (4)

(2) Analog Measurement of Electrical Quantities- Electrodynamic, Thermocouple, Electrostatic & Rectifier type ammeters & voltmeters, Electrodynamic wattmeter, Three Phase wattmeter, Power in three phase systems, Errors & remedies in wattmeter and energy meter. (5)

UNIT II

Instrument Transformers:CT and PT; their errors, Applications of CT and PT in the extension of instrument range, Introduction to measurement of speed, frequency and power factor. (8)

UNIT III

Measurement of Parameters- Different methods of measuring low, medium and high resistances**,** measurement of inductance & capacitance with the help of AC Bridges, Q meter. (9)

UNIT IV

(1) AC Potentiometers- Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement. (4)

(2) Magnetic Measurement- Ballistic galvanometer, Flux meter**,** Determination of hysteresis loop, measurement of iron losses**.** (4)

UNIT V

(1) Digital Measurement of Electrical Quantities- Concept of digital measurement, Block diagram, Study of digital voltmeter, Frequency meter, *Spectrum analyzer*, Electronic multimeter. (3)

(2) Cathode Ray Oscilloscope- Basic CRO circuit (block diagram), Cathode Ray Tube (CRT) & its components**,** Applications of CRO in measurement, Lissajous Pattern, Dual trace & dual beam oscilloscopes. (3)

Text Book:

1. E. W. Golding & F. C. Widdis, "Electrical Measurement &Measuring Instrument", A. W. Wheeler & Co. Pvt. Ltd. India
2. A. K. Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH

Reference Books:

4. Forest K. Harris, "Electrical Measurement", Willey Eastern Pvt. Ltd. India
5. M. B. Stout , "Basic Electrical Measurement", Prentice Hall of India
6. W. D. Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
7. J. B. Gupta, "Electrical Measurement & Measuring Instrument", S. K. Kataria & Sons

NEE-303- BASIC SYSTEM ANALYSIS
L T P 3 1 0

UNIT I

Introduction to Continuous Time Signals and Systems- Basic continuous time signals, Unit step, Unit ramp, Unit impulse and periodic signals with their mathematical representation and characteristics. *Inversion, Shifting and Scaling of signals,* Introduction to various types of systems, *Causal, Stable, Linear and Time invariant systems.*

Analogous System- Linear mechanical elements, Force-voltage and force-current analogy, Modeling of mechanical and electro-mechanical systems. (9)

UNIT II

Fourier Transform Analysis- Exponential form and *compact* trigonometric form of Fourier series, Fourier symmetry, Fourier Transform: Properties, Applications to network analysis. (8)

UNIT III

Laplace Transform- Review of Laplace Transform, Initial and Final Value theorems, Inverse Laplace Transform, Convolution theorem, Application of Laplace Transform to analysis of networks, Waveform synthesis and Laplace Transform of complex waveforms. (8)

UNIT IV

State – Variable Analysis- Introduction, State Space representation of linear systems, Transfer Function and State Variables, State Transition Matrix, Solution of State Equations for homogeneous and non-homogeneous systems, Applications of State-Variable technique to the analysis of linear systems. (8)

UNIT IV

Z-Transform Analysis- Concept of Z-Transform, Z-Transform of common functions, Inverse Z Transform, Initial and Final Value theorems, Applications to solution of difference equations, Pulse Transfer Function. (7)

Text Books:

1. Oppenhiem, Wilsky, Nawab, "Signals & Systems", PHI
2. M E Van-Valkenberg; " Network Analysis", Prentice Hall of India
3. A. Anand Kumar, " Signals & Systems", PHI
4. Choudhary D. Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

5. David K. Cheng; "Analysis of Linear System", Narosa Publishing Co
6. Donald E. Scott, "Introduction to circuit Analysis" Mc. Graw Hill
7. B. P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
8. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Singnals and Systems", Tata Mc. Graw Hill, 2001.
9. Taan S. Elali & Mohd. A. Karim, "Continuous Signals and Systems with MATLAB" 2nd Edition, CRC Press.

NEE-401: ELECTRO-MECHANICAL ENERGY CONVERSION - II

L T P 3 1 0

UNIT - I

Synchronous Machine I - Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient. (9)

UNIT - II

Synchronous Machine II - Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor - Starting methods, Effect of varying field current at different loads, V-curves, Hunting & damping, Synchronous condenser. (8)

UNIT - III

Three phase Induction Machine – I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque- slip characteristics, No load & blocked rotor tests, Efficiency, Induction generator & its applications. (9)

UNIT - IV

Three phase Induction Machine- II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed control (with and without emf injection in rotor circuit). (8)

UNIT - V

Single phase Induction Motor - Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, Repulsion motor.

AC Commutator Motors - Universal motor, Single phase a.c. series compensated motor, Stepper motors. (8)

Text Books:

1. D.P.Kothari & I.J.Nagrath, "Electric Machines", Tata Mc Graw Hill
2. Ashfaq Hussain "Electric Machines", Dhanpat Rai & Company
3. Fitzerald,A.E.,Kingsley and S.D.Umans "Electric Machinery", MC Graw Hill.
4. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher

Reference Books:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers
6. M.G.Say, "Alternating Current Machines", Pitman & Sons

NEE- 402 NETWORK ANALYSIS AND SYNTHESIS

L T P 3 1 0

Unit – I

Graph Theory- Graph of a network, Definitions, Tree, Co tree, Link, basic loop and basic cut set, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analyses. (7)

Unit – II:

Network Theorems (Applications to AC Networks)- Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's theorem. (8)

Unit – III

Transient Circuit Analysis- Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods. (7)

Unit – IV

Network Functions- *Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.* (3)

Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, A'B'C'D', g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & Π representation. (8)

Unit – V

(a) Network Synthesis- Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms. (5)

(b) Filters- Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters. (4)

Text Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. C. L. Wadhwa, "Network Analysis and Synthesis", New Age International Publishers
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill
3. M. E. Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T. S. K. V. Iyer, "Circuit Theory", Tata McGraw Hill
5. Joseph A. Edminister, " Theory & Problems of Electric Circuits", McGraw Hill

NEE – 403: ELECTRICAL INSTRUMENTATION AND PROCESS CONTROL

L T P 2 1 0

Unit-I

Transducer – I

Definition, Advantages of electrical transducers, Classification, Characteristics, Factors affecting the choice of transducers, Potentiometers, Strain guages, Resistance thermometer, Thermistors, Thermocouples, LVDT, RVDT (7)

Unit-II

Transducer – II

Capacitive, Piezoelectric, Hall effect and Opto electronic transducers. Measurement of motion, force, pressure, temperature, flow and liquid level. (6)

Unit-III

Telemetry

General telemetry system, Land line & radio frequency telemetering systems, Transmission channels and media, Data receiver & transmitter.

Acquisition System

Analog data acquisition system, Digital data acquisition system, Modern digital data acquisition system. (8)

Unit-IV

Display Devices and Recorders

Display devices, Storage oscilloscope, Spectrum analyzer, Strip chart & X-Y recorders, Magnetic tape & digital tape recorders.

Process Control

Principle, Elements of process control system, Process characteristics, Electronic, pneumatic & digital controllers. (7)

Text Books:

1. A. K. Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons
2. B.C. Nakra & K.Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition.
3. Curtis Johns, “Process Control Instrumentation Technology”, Prentice Hall

Reference Books:

4. E. O. Decblin, “Measurement System – Application & design”, Mc Graw Hill.
5. W. D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International
6. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher
7. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI Learning.

NEE 409 ELECTRICAL MACHINES & AUTOMATIC CONTROL

L T P 3 1 0

UNIT I

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests.

Three Phase Transformer: Three phase transformer connections, Auto Transformer: Volt- Amp relations, Efficiency, Advantages & Disadvantages, Applications.

D.C. Motors: Concept of starting, Speed control, Losses and Efficiency *(simple numericals only)*

UNIT II

Three phase Induction Motor: Construction, Equivalent circuit, Torque equation and torque- slip characteristics, Speed control *(simple numericals only)*.

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. *(simple numericals only)*

Synchronous Motor *(conceptual treatment only)*: Starting, Effect of excitation on line current (V-curves), Synchronous condenser.

Servo Motor: Two phase AC and DC servo motors & their applications.

UNIT III

Modeling of Mechanical System: Linear mechanical elements, Force-voltage and force- current analogy, Electrical analog of simple mechanical systems; Concept of transfer function & its determination for simple systems.

Control System: Open loop & closed loop controls systems; advantages and disadvantages.

Signals: Unit step, Unit ramp, Unit impulse and Periodic signals with their mathematical representation and characteristics.

UNIT IV

Time Response Analysis: Time response of a standard second order system and response specifications.

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, Limitations (*simple numerical only*); *Only conceptual treatment of* Polar plot, Nyquist stability criterion and assessment of stability.

UNIT V

Root Locus Techniques: Concept of root locus, construction of root loci. Bode plot, Gain margin and Phase margin and their determination.

Process control: Introduction to P, PI and PID controllers their characteristics, representation and applications.

Text Book:

1. I. J. Nagrath & D. P. Kothari, “Electrical machines”, Tata McGraw Hill.
2. P.S.Bimbhra, “Electrical Machinery”, Khanna Publishers
3. K. Ogata, “Modern Control Engineering”, Prentice Hall of India.
4. Ghosh, “Control Systems: Theory and Applications”, Pearson

Reference Books:

5. B.C. Kuo, “Automatic Control systems”, Wiley India Ltd.
6. D. Roy Choudhary, “Modern Control Engineering” Prentice Hall of India.
7. M. Gopal, “Control Systems: Principles and Design” Tata McGraw Hill.

NEE – 459 : ELECTRICAL MACHINES & AUTOMATIC CONTROL LAB

L T P 0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System [Out of total 10, at least 04 experiments should be Simulation based]

A. Electrical Machines

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To perform load test on a 3-phase induction motor and determine (i) speed- torque characteristics (ii) power factor v/s line current characteristics.
8. To study speed control of a 3-phase induction motor using (a) Voltage Control, (b) Constant (Voltage/ frequency) control.
9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. Automatic Control System:

1. To determine transient response of a second order system for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an AC 2-phase servo motor.
4. To study dc servo position control system within P and PI configurations.
6. To study Synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

NEE-351: ELECTROMECHANICAL ENERGY CONVERSION- I LAB
L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1 To obtain magnetization characteristics of a d.c. shunt generator.
2 To obtain load characteristics of a d.c. shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3 To obtain efficiency of a dc shunt machine using Swinburn's test.
4 To perform Hopkinson's test and determine losses and efficiency of DC machine.
5 To obtain speed-torque characteristics of a dc shunt motor.
6 To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
7 To obtain speed control of dc separately excited motor using Conventional Ward-Leonard/Static Ward –Leonard method.
8 To study polarity and ratio test of single phase and 3-phase transformers.
9 To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using C.C. and S.C. tests.
10 To obtain efficiency and voltage regulation of a single phase transformer by Sumpner's test.
11 To obtain 3-phase to 2-phase conversion by Scott connection.
12 To determine excitation phenomenon (B.H. loop) of single phase transformer using C.R.O.

College may add any two S/W based experiments in the above list.

NEE-352: ELECTRICAL MEASUREMENT LAB
L T P 0 0 3

Note : Minimum eight experiments are to be performed from the following list:

1. Calibration of ac voltmeter and ac ammeter.
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter.
3. Measurement of phase difference and frequency of a sinusoidal ac voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor.
5. Measurement of low resistance by Kelvin's double bridge.
6. Measurement of voltage, current and resistance using dc potentiometer.
7. Measurement of inductance by Maxwell's bridge.
8. Measurement of inductance by Hay's bridge.
9. Measurement of inductance by Anderson's bridge.
10. Measurement of capacitance by Owen's bridge.
11. Measurement of capacitance by De Sauty bridge.
12. Measurement of capacitance by Schering bridge.
13. Study of frequency and differential time counter.

College may add any two experiments in the above list.

NEE-353: NUMERICAL TECHNIQUE LAB

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list:

S/W Based Experiments using MATLAB or Equivalent software.

1. Solution of linear equations for under damped and over damped cases.
2. Determination of eigen values and eigenvectors of a square matrix.
3. Determination of roots of a polynomial.
4. Determination of polynomial using method of least square curve fitting.
5. Determination of polynomial fit, analyzing residuals, exponential fit and error bounds from the given data.
6. Solution of differential equations using 4th order Runge-Kutta method.
7. Solution of differential equation using revised Euler method.
8. Solution of difference equations.
9. Determination of time response of an R-L-C circuit.

College may add any three experiments in the above list.

NEE- 451: ELECTRO-MECHANICAL ENERGY CONVERSION – II LABORATORY

L T P 0 0 3

Note: Minimum eight experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque -speed characteristics
   (ii) Power factor-line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.
5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
6. To determine V-curves and inverted V-curves of a three phase synchronous motor.
7. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.
8. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method.

Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent software)

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
13. To determine steady state performance of a three phase induction motor using equivalent circuit.

NEE-452: NETWORK LABORATORY

L T P 0 0 2

Note: Minimum eight experiments are to be performed from the following list.

1. Verification of principle of superposition with ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits.
3. Verification of Tellegin's theorem for two networks of the same topology.
4. Determination of transient response of current in RL and RC circuits with step voltage input.
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases.
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input.
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD Parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade.
11. Determination of frequency response of a Twin – T notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.

College may add any three S/W based experiments in the above list.

NEE – 453: ELECTRICAL INSTRUMENTATION LAB.

L T P 0 0 2

Minimum eight experiments are to be performed from the following list.

1. Measurement of displacement using LVDT.
2. Measurement of displacement using strain gauge based displacement transducer.
3. Measurement of displacement using magnetic pickup.
4. Measurement of load using strain gauge based load cell.
5. Measurement of water level using strain gauge based water level transducer
6. Measurement of flow rate by anemometer
7. Measurement of temperature by RTD.
8. Measurement of temperature by thermocouple
9. Study of P,PI and PID controllers
10. Study of storage oscilloscope and determination of transient response of RLC circuit.
11. Determination of characteristics of a solid state sensor/fibre-optic sensor
12. Design and test a signal conditioning circuit for any transducer

College may add any three S/W based experiments in the above list.

NEE-454 ELECTRONICS LAB

L T P 0 0 2

ANALOG ELECTRONICS:

Note: Select at least any four out of the following:

1. To Plot V-I characteristics of junction diode and zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input / output characteristics for common base transistor.
4. To Plot input /output characteristics of FET and determine FET parameters at a given operating point.
5. To determine voltage gain, current gain, input impedance and output impedance of common emitter amplifier.
6. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
7. To design R-C Phase shift / Wein Bridge oscillator and verify experimentally the frequency of oscillation.
8. To study transistor as a switch and determine load voltage and load current when the transistor is ON.

ANALOG IC & DIGITAL ELECTRONICS:

Note: Select at least any four out of the following:

9. To study application of Operational Amplifier as summer integrator and voltage comparator.
10. To study operation of Op-Amp based astable and monostable multivibrators.
11. To study operation IC 555 based astable and monostable multibrators.
12. To study operation of (a) multiplexer using IC 74150 (b) demultiplexer using IC 74138.
13. To study operation of Adder / Subtractor using 4 bit / 8 bit IC 7483.
14. To study operation of (a) J K Master – slave flip – flop using IC 7476 (b) Modulo N counter using programmable counter IC74190.
15. To verify experimentally output of A/D and D/A converters.
16. To study regulation of unregulated power supply using IC 7805/7812 voltage regulator and measure the load and line regulations

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS FOR

B. TECH. III YEAR

ELECTRONICS ENGINEERING/ ELECTRONICS & COMMUNICATION ENGINEERING/ ELECTRONICS & TELECOMMUNICATION ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]

EVALUATION SCHEME

B.TECH. ELECTRONICS ENGINEERING, B.TECH.
ELECTRONICS & COMMUNICATION ENGINEERING, B.TECH. ELECTRONICS &
TELECOMMUNICATION ENGINEERING

YEAR 3rd/ SEMESTER V

Sr. No.	Sub Code	Subject Name	L-T-P	Th/Lab Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS501	Managerial Economics	3--0--0	70	20	10	100	3
2	RAS502 /RUC501	Sociology/Cyber Security	3--0--0	70	20	10	100	3
3	REC501	Integrated Circuits	3--0--0	70	20	10	100	3
4	REC502	Principles of Communication	3--1--0	70	20	10	100	4
5	REC503	Digital Signal Processing	3--0--0	70	20	10	100	3
6	REC051-055	Deptt. Elective Course 1	3--1--0	70	20	10	100	4
7	REC551	Integrated Circuits Lab	0--0--2	50		50	100	1
8	REC552	Communication Lab – I	0--0--2	50		50	100	1
9	REC553	Digital Signal Processing Lab	0--0--2	50		50	100	1
10	REC554	CAD of Electronics Lab-I	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–1

1. REC051 - Antenna & wave propagation
2. REC052 - Computer Architecture and Organization
3. REC053- Real Time Systems
4. REC054- Artificial Neural Networks
5. REC055- Advance Semiconductor devices

EVALUATION SCHEME

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engineering, B.Tech. Electronics & Telecommunication Engineering

YEAR 3rd/ SEMESTER VI

Sr. No	Sub Code	Subject Name	L-T-P	Th/LAB Marks	Sessional		Total	Credit
				ESE	CT	TA		
1	RAS601	Industrial Management	3--0--0	70	20	10	100	3
2	RAS602 / RUC601	Sociology /Cyber Security	3--0--0	70	20	10	100	3
3	RIC603	Control System I	3--0--0	70	20	10	100	3
4	REC601	Microwave Engineering	3--1--0	70	20	10	100	4
5	REC602	Digital Communication	3--0--0	70	20	10	100	3
6	REC061 - 065	Deptt. Elective Course 2	3--1--0	70	20	10	100	4
7	REC-651	Microwave Engg Lab	0--0--2	50		50	100	1
8	REC-652	Communication Lab- II	0--0--2	50		50	100	1
9	RIC-653	Control System Lab-I	0--0--2	50		50	100	1
10	RIC-651	Microcontrollers For Embedded Systems Lab	0--0--2	50		50	100	1
	TOTAL			620	120	260	1000	24

DEPTT ELECTIVE COURSE–2

1. REC061 - Industrial Electronics
2. REC062 - Microcontroller for Embedded Systems
3. REC063 - Analog Signal Processing
4. REC064 - Advance Digital Design Using Verilog
5. REC065- RADAR Engineering

REC501 **INTEGRATED CIRCUITS**

Unit	Topic	Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors. **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design- An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, AnalogMultipliersand their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters Integrated Circuit Timer:** The 555 Circuit, Implementing a Mono stable Multi-vibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Book:

1. Sedra and Smith, “Microelectronic Circuits”, 6thEdition, Oxford University Press.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 2nd Edition.
3. A. K. Maini, Analog Circuits, Khanna Publishing House, Delhi.

Reference Books:

1. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Edition, Tata McGraw Hill.
2. BehzadRazavi, “Fundamentals of Microelectronics”, 2nd Edition, Wiley.
3. Mark N. Horenstein, “Microelectronic Circuits and Devices”, PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf
6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

REC502	PRINCIPLES OF COMMUNICATION	
Unit	Topic	Lectures
I	Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.	7
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy	9
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill.
2. Rishabh Anand, Communication Systems, Khanna Publishing House, Delhi

Reference Books:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

REC503 **DIGITAL SIGNAL PROCESSING**

Unit	Topics	Lectures
I	Realization of Digital Systems: Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization, FIR Filter Realization: Direct & Cascade, FIR Linear Phase Realization.	8
II	Design of Infinite Impulse Response Digital Filters: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and ChebyshevFilters, Frequency Transformations.	8
III	Finite Impulse Response Filter Design: Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window, Finite Word length effects in digital filters.	8
IV	DFT & FFT: Definitions, Properties of the DFT, Circular Convolution, Linear Convolution using Circular Convolution, Decimation in Time (DIT) Algorithm, Decimation in Frequency (DIF) Algorithm.	8
V	Multirate Digital Signal Processing: Introduction, Decimation, Interpolation, Sampling rate conversion: Single and Multistage, SubbandCoding of Speech signals, Quadrature mirror filters.	8

Text Book:

1. Johnny R. Johnson, .Digital Signal Processing., PHI Learning Pvt Ltd., 2009.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, .Digital Signal Processing. Pearson Education.
2. Oppenheim & Schafer, . Digital Signal Processing. PHI

LABORATORY

REC551 INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of thecircuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for-
   - **a)** Low pass filter of specified cut off frequency.
   - **b)** High pass filter of specified frequency.
   - **c)** Band pass filter with unit gain of specified pass band
   - **d)** Design a notch filter to eliminate 50Hz power line frequency.
4. Wien bridge oscillator using operational amplifier.
5. Astable and mono-stable multivibrators using IC 555.
6. Design the following amplifiers:
   - **a)** A unity gain amplifier.
   - **b)** A non-inverting amplifier with a gain of "A".
   - **c)** An inverting amplifier with a gain of "A".
   - **d)** Log and antilog amplifiers.
   - **e)** Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency „f". Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC.

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

REC552 **COMMUNICATION LAB-I**

List of Experiments

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation.
   a) using switching method
   b) by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To study Pulse code modulation and demodulation technique.
11. To study Delta modulation and demodulation technique.
12. Design and implement an FM radio receiver in 88-108 MHz

REC553 **DIGITAL SIGNAL PROCESSING LAB**

List of Experiments

1. To study about DSP Processors and architecture of TMS320C6713 DSP processor.
2. Introduction to MATLAB and Code Composer Studio or its equivalent open source software.
   OR
   Introduction to Scilab Open Source Software (Using Spoken Tutorial MOOCs)
3. Write a Program for the generation of basic signals such as unit impulse, unit step, ramp, exponential, sinusoidal and cosine.
4. To study matrix multiplication using code composer studio.
5. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3$; 0 elsewhere.
6. To implement FFT algorithm.
7. Verify Blackman and Hamming windowing techniques.
8. Implement IIR Butterworth analog Low Pass for a 4 KHz cut off frequency.
9. Verify Circular Convolution using code composer studio.
10. Verify Linear convolution of two sequence using code composer studio.
11. To implement Tone Generation.
12. To implement floating point arithmetic.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

REC554CAD OF ELECTRONICS LAB- I

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient &DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.
6. Design and Simulation of a Differential Amplifier (with Resistive Load, Current Source Biasing)
7. Analysis of frequency response of Common Source amplifiers.
8. Analysis of frequency response of Source Follower amplifiers.
9. Analysis of frequency response of Cascode amplifiers.
10. Analysis of frequency response of Differential amplifiers.

DEPARTMENTAL ELECTIVE COURSE 1

REC051	ANTENNA AND WAVE PROPAGATION	
Unit	Topic	Lectures
I	Antennas Basics:Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	5
II	Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non-uniform Amplitude Distributions. General Considerations.	8
III	Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	8
IV	The Loop Antenna:Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. Reflector Antennas: Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	9
V	Ground Wave Propagation: Plane Earth Reflection, Space Wave and Surface Wave. Space Wave Propagation: Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. Sky wave Propagation: Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	10

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, “Antennas and Wave Propagation”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. A. R. Harish, M. Sachidananda, “Antennas and Wave Propogation”, Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, “Electromagnetic Waves and Radiating Systems”, PHI.
3. R.L. Yadava, Electromagnetic Waves, Khanna Publishing House, Delhi.
4. A. Das, Sisir K. Das, “Microwave Engineering”, Tata McGraw Hill.

REC052	Computer Architecture and Organization	
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8
III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.
4. I. Singh, Computer Organisation and Architecture, Khanna Publishing House, Delhi

REC053	REAL TIME SYSTEMS	
Units	**Topic**	**Lectures**
I	**Introduction to Real Time** System Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8
II	**Embedded Hardware for Real Time** System Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware** – On chip Peripherals and Communication protocols Role of peripherals for Real time systems, On-Chip peripherals& hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI &UART. Introduction to the CCS IDE: its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. Programming: demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M “Real Time Systems” Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, “DSP based Electromechanical Motion Control” CRC Press Publication.
4. Jean J Labrosse, “Embedded System Design blocks”, CMP books Publication
5. John H Davies, “MSP430 Microcontroller Basics” Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication

REC054	Artificial Neural Network	
Unit	**Topic**	**Lectures**
I	**Introduction to ANN:** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks -** History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8
IV	**a)Feedforward neural networks --** Linear responsibility X-OR problem and solution. **-** Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran ,VijayalakshmiPari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

REC055	**ADVANCE SEMICONDUCTOR DEVICES**	
Unit	Topics	Lectures
I	Physics of Semiconductors, P-N Junction Diode and BJT: Introduction, Crystal Structure, Phonon, Optical, and Thermal Properties,*p-n* Junctions –Junction Breakdown, Transient Behavior and Noise Terminal Functions.BJT:Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor.	8
II	MOSFET, Hetero-Junctions and Basics of Nanostructures: MOSFET: Basic Device Characteristics, Nonuniform Doping and Buried Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Single Electron Transistor, JFETs. Hetero-junctions:Metal-Semiconductor Contacts, Metal-Insulator-Semiconductor Capacitors. MESFETs and MODFETs. Nanostructures: Basic Equations and Examples.	8
III	TUNNEL Devices and IMPATT Diodes: TUNNEL DEVICES:Tunnel Diode, Related Tunnel Devices, Resonant Tunneling Diode. IMPATT Diodes: Static Characteristics, Dynamic Characteristics, Power and Efficiency Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode	8
IV	Power devices, Photonic devices:Transferred-Electron and Real-Space-Transfer Devices Thyristors, Power Devices. Photonic Devices and Sensors: Radiative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers	8
V	Photodetectors, Solar Cells and Sensors:Photodiodes, Avalanche Photodiode and Phototransistor, Charge-Coupled Device (CCD), Metal- Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell Sensors: Thermal Sensor, Mechanical Sensors, Magnetic Sensors and Chemical Sensors	8

Text Book:

1. S. M. Sze, Kwok K. NG, “Physics of Semiconductor Devices”, 3rd Edition, Wiley Publication

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics Of Semiconductor Devices", Kluwer Academic Publishers
2. B. G. Streetman and S. Banerjee “Solid state electronics devices”, 5th Edition, PHI.
3. SupriyoDatta, “Quantum Transport Atom to Transistor”, Cambridge University Press, 2005
4. A.K. Maini, All in One Electronics Simplified, Khanna Publishing House, Delhi

RIC603 **CONTROL SYSTEM-I**		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems, Analogous Systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability, Eigen Value and Eigen Vector, Diagonalization.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci.	8
V	Frequency Domain Analysis: Mr (resonant peak) and ωr (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Polar Plot, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with the Bode plot.	8

Text Book:

1. B.C. Kuo&FaridGolnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. I. J. Nagrath& M. Gopal, "Control System Engineering", New Age International Publishers
2. A. Ambikapathy, Control Systems, Khanna Publishing House, Delhi.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rdEdition, Tata McGraw Hill, Special Indian Edition 2010.
3. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.

REC601	MICROWAVE ENGINEERING	
Unit	**Topics**	**Lectures**
I	**Rectangular & circular waveguides:Introduction to microwave communication and EM spectrum**, Rectangular wave guide: Field Components, TE, TM Modes, Dominant TE10 mode, Field Distribution, Power, Attenuation. Circular waveguides: TE, TM modes. Wave velocities, Microstrip transmission line (TL), Coupled TL, Strip TL, Coupled strip line, Coplanar TL, Microwave cavities	11
II	**Passive microwave devices:** Scattering matrix, Passive microwave devices: Microwave hybrid circuits, Terminations, Attenuators, Phase Shifters, Directional couplers: Two-hole directional couplers, S- Matrix of a directional coupler, Hybrid couplers, Microwave propagation in ferrites, Faraday rotation, Isolators, Circulators. S-parameter analysis of all components.	10
III	**Microwave tubes :**Microwave tubes: Limitations of conventional active devices at microwave frequency, Two cavity Klystron, Reflex Klystron, Magnetron, Traveling wave tube, Backward wave oscillators, Gyro Devices: Their schematic, Principle of operation, Performance characteristic and their applications.	7
IV	**Solid state amplifiers and oscillators:** Transferred electron devices: Gunn-effect diodes & modes of operation. Avalanche transit – time devices: IMPATT diode, TRAPPAT diode, BARITT diode.	5
V	**Microwave Measurements:** VSWR meter, Frequency meter, Spectrum analyser, Network analyser,Tunable detector, Slotted line carriage, Power meter, Microwave power measurement, Insertion loss and attenuation measurement, VSWR measurement, Return loss measurement by a reflectometer, Frequency measurement, measurement of cavity Q, Dielectric constant measurement of a solid, EM radiation & measurement.	7

Text Books:

1. G. S. Raghuvanshi, Microwave Engineering; Cengage
2. S.Y. Liao, Microwave Devices & Circuits; PHI 3rd Ed.

Reference Books:

1. A Das and S.K. Das, Microwave Engineering; McGraw Hill Education
2. S. Vasuki, D Margaret Helena, R Rajeswari, Microwave Engineering; MHE
3. M.I. Skolnik, Introduction to Radar Engineering ; TMH
4. Om P. Gandhi, Microwave Engineering and Applications; Pergamon Press

REC602	DIGITAL COMMUNICATION	
Unit	**Topic**	**Lectures**
I	Principles of digital data transmission: Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system. Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, Quadrature modulation techniques. (QPSK and MSK), M-ary Digital carrier Modulation.	08
II	Fundamentals of probability theory & random process : Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes Power spectral density, Multiple random Processes.	08
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers	08
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications Introduction to information theory: Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel. Capacity of a discrete and Continuous Memory less channel.	08
V	Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability Linear block codes: encoding and syndrome decoding. Cyclic codes: encoder and decoder for systematic cyclic codes. Convolution codes, code tree and Trellis diagram, Viterbi and sequential decoding, Burst error correction, Turbo codes.	08

Text Book:

1. B.P. Lathi, “Modern Digital and Analog communication Systems”, 4th Edition, Oxford University Press, 2010.
2. RishabhAnand, Communication Systems, Khanna Publishing House, Delhi.

Reference Books:

1. H. Taub, D L Schilling, GautamSaha, “Principles of Communication”, 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. John G. Proakis, “Digital Communications”, 4th Edition, McGraw-Hill International.
3. Simon Haykin, “Communication Systems”, 4th Edition, Wiley India.
4. H P HSU & D Mitra, “Analog and Digital Communications”, 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

LABORATORY

REC651 **MICROWAVE ENGINEERING LAB**

List of Experiments

1. To study microwave test bench.
2. To study the characteristics of reflex klystron tube and to determine its electronic tuning range.
3. To determine the frequency and wavelength in a rectangular waveguide working on TE_{01} mode.
4. To study measurement of reflection coefficient and standing wave ratio using double minima method.
5. To study V-I characteristic of Gunn diode.
6. To measure an unknown impedance with Smith chart.
7. Study of Circulator/Isolator.
8. Study of Attenuator (Fixed and Variable type).
9. To study simple dipole $\lambda/2$ antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
10. To study folded dipole antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
11. To study $\lambda/2$ phase array end-fire antenna and to calculate beam-width, front / back ratio, and gain of the antenna.
12. To study broadside array antenna and to calculate beam-width, front / back ratio, and gain of the antenna.

REC652 **COMMUNICATION LAB – II**

List of Experiments

1. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component
2. Study of pulse data coding & decoding techniques for NRZ and RZ formats.
3. Study of Manchester coding and Decoding.
4. Study of Amplitude shift keying modulator and demodulator.
5. Study of Frequency shift keying modulator and demodulator.
6. Study of Phase shift keying modulator and demodulator.
7. Study of single bit error detection and correction using Hamming code.
8. Study of Quadrature Phase shift keying modulator and demodulator.
9. To simulate Differential Phase shift keying technique using MATLAB software.
10. To simulate M-ary Phase shift keying technique using MATLAB software (example8PSK, 16PSK) and perform BER calculations.
11. To simulate convolutional coding using MATLAB software.
12. Design a front end BPSK modulator and demodulator.

RIC653<u>**CONTROL SYSTEM LAB-I**</u>

List of Experiments:

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolboxor its equivalent open source freeware software like Scilabusing Spoken Tutorial MOOCs.
2. Determine transpose, inverse values of given matrix.
3. Plot the pole-zero configuration in s-plane for the given transfer function.
4. Determine the transfer function for given closed loop system in block diagram representation.
5. Plot unit step response of given transfer function and find delay time, rise time, peak time and peak overshoot.
6. Determine the time response of the given system subjected to any arbitrary input.
7. Plot root locus of given transfer function, locate closed loop poles for different values of k. Also find out Wd and Wnat for a given root.
8. Create the state space model of a linear continuous system.
9. Determine the State Space representation of the given transfer function.
10. Plot bode plot of given transfer function. Also determine the relative stability by measuring gain and phase margins.
11. Determine the steady state errors of a given transfer function.
12. Plot Nyquist plot for given transfer function and to discuss closed loop stability. Also determine the relative stability by measuring gain and phase margin.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

RIC651 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

DEPARTMENTAL ELECTIVE COURSE 2

REC061	**INDUSTRIAL ELECTRONICS**	
Unit	Topics	Lectures
I	**Power Semiconductor Devices**: Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	8
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters**: Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, stepup/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. Control of D.C. Drives: Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	8
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	8
V	Protection of device and circuits: Introduction, Cooling and heat sinks, Thermal Modeling of Power Switching devices, Snubber Circuits, Reverse Recovery Transients, Supply- and Load- side Transients, Voltage Protection, Current Protections, Electromagnetic Interference.	8

Text Books:

1. M. H. Rashid, "Power Electronics", 3rd Edition, Pearson Education.
2. M. D. Singh & K. Khanchandani, "Power Electronics", Tata McGraw Hill.

Reference Books:

1. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press,2007.
2. M.S. JamilAsghar, "Power Electronics",PHI.
3. Chakrabarti&Rai, "Fundamentals of Power Electronics &Drives"DhanpatRai& Sons.
4. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India.
5. S.N.Singh, "A Text Book of Power Electronics",DhanpatRai& Sons.

REC602 MICROCONTROLLER FOR EMBEDDED SYSTEMS

Unit	Topic	Lectures
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlayRolin D “ The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson Publication.
2. John H Davies, “MSP430 Microcontroller Basics” Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide.

REC063	**ANALOG SIGNAL PROCESSING**	
Unit	Topics	Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. Second-order filter realization, filter design parameters (Q and ω_0), frequency response, Three op-amp biquad, effect of finite gain of op-amp over filters, Sallen-Key biquad.	10
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications, comparison of Maximally flat and Equal ripple responses.	8
III	Delay equalization: equalization procedures, equalization with first-order and second order modules, strategies for equalization design. Definition of Bode sensitivity.	7
IV	The General Impedance Convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8
V	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, Gyrator, First and second order filters, Higher order filters	**7**

Text Book:

1. R. Schaumann and M.E. Valkenberg,"Design of Analog Circuits", Oxford University Press

REC064 ADVANCED DIGITAL DESIGN USING VERILOG		
Unit	**Topic**	**Lectures**
I	ntroduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Introduction to Verilog, Behavioral and Structural specification of logic circuits, Boolean function implementation using Verilog, Timing Analysis, Hazard Detection and Elimination	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous StateMachines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi-levelminimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis incombinational and sequential systems, Path Sensitization method, Boolean DifferenceMethod, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures,Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Richard F. Tinder, "Engineering Digital Design", Academic Press.
2. Parag K. Lala, "Digital system Design Using PLDs", PHI India Ltd.
3. Stephen Brown and ZvonkoVranesiv, "Fundamental of Digital Logic with Verilog Design", Tata McGraw Hill.

Reference Books:1. John Williams, "Digital VLSI Design with Verilog", Springer Publication.
2. Eugene Fabricius, "Modern Digital Design and Switching Theory", CRC Press.
3. Samuel C. Lee, "Digital Circuit and Logic Design", PHI India Ltd.
4. Alexander Miczo, "Digital Logic Testing and Simulation",WileyInterscience.

REC065RADAR ENGINEERING

Unit	Topics	Lectures
I	**Introduction to Radar:** Basic radar, The simple form of radar equation, Radar block diagram, Radar frequencies, Applications to radar.	5
II	**Radar Equation:** Introduction, Detection of signal in noise, Receiver noise and the signal to noise ratio, Probability density functions, Probabilities of detection and false alarm, Integration of Radar pluses, Radar cross section of targets, Radar cross section fluctuations, Transmitter power, Pulse repetition frequency, antenna parameters, system losses, Other Radar equation considerations.	9
III	**MTI and Pulse Doppler Radar:** Introduction to Doppler and MTI Radar, Delay-Line cancelers, Staggered pulse repetition frequencies, Doppler filter banks, Digital MTI processing, Moving target detector, Limitation of MTI performance, MTI from a moving platform, Pulse Doppler Radar, CW Radar.	9
IV	**Tracking Radar:** Tracking with Radar, Mono-pulse tracking, Conical scan and sequential lobbing, Limitation to tracking accuracy, Low-angle tracking, Tracking in range, Comparison of trackers, Automatic tracking with Surveillance Radar (ADT)	8
V	**Information from Radar signals:** Basic Radar measurements, Ambiguity diagram, Pulse compression, Target recognition. **Radar Clutter:** Land clutter, Sea clutter, Weather clutter and detection of targets in clutter.	9

Text Book:

1. Merrill I. Skolnik“ Introduction to Radar Systems” Third Edition.

Reference Book:

1 J.C. Toomay , Paul J. Hannen “ Principles of Radar” Third Edition.
2 GottapuSasibhusanaRao, “Microwave and Radar Engineering, Pearson.
3 Bernard Davis,George Kennedy, Electronic Communication Systems, Tata McGraw-Hill Education Pvt. Ltd.

U. P. TECHNICAL UNIVERSITY,

IET CAMPUS, SITAPUR ROAD, LUCKNOW- 226 021

COURSE STRUCTURE AND SYLLABUS

(EFFECTIVE FROM Session: 2015-16)

B.Tech. (Civil Engineering)

Third Year (5th & 6th Semester)

JULY 10, 2015

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 5th Semester

S.No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
2	NCE 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	NCE 502	Transportation Engineering-1	3	1	0	30	20	50	100	150	4
4	NCE 503	Environmental Engineering-1	2	1	0	15	10	25	50	75	3
5	NCE 504	Structural Analysis-2	3	1	0	30	20	50	100	150	4
6	NCE 505	Design of Concrete Structure-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	NCE 551	Geotechnical Engineering Lab	-	-	3	10	10	20	30	50	1
8	NCE 552	Transportation Engineering Lab	-	-	3	10	10	20	30	50	1
9	NCE 553	CAD Lab-1	-	-	3	10	10	20	30	50	1
10	NCE 554	Estimation Costing & Valuation			3	10	10	20	30	50	1
11	NGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		TOTAL	16	5	12					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 6th Semester

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam					
			L	T	P	CT	TA	Total	ESE		
THEORY SUBJECTS											
1	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
2	NCE 601	Design of Concrete Structure-2	3	1	0	30	20	50	100	150	4
3	NCE 602	Environmental Engineering-2	3	1	0	30	20	50	100	150	4
4	NCE 603	Construction Technology & Management	3	1	0	30	20	50	100	150	4
5	NCE 011 -014	Departmental Elective-1	3	1	0	30	20	50	100	150	4
6	NCE 021-024	Departmental Elective-2	2	1	0	15	10	25	50	75	3
PRACTICAL/DRAWING/DESIGN											
7	NCE 651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
8	NCE 652	Environmental Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCE 653	CAD Lab-2	0	0	3	10	10	20	30	50	1
10	NCE 654	Survey Camp*	0	0	0	0	0	50		50	1
11	NGP 601	General Proficiency	0	0	0	0	0	50	-	50	
		TOTAL	16	5	9					1000	25

Note:*The teaching load of survey camp will be counted as equivalent to 0-0-3.

Departmental Elective -1 (Full Unit Course with Credit: 4)

Sl.No.	Code and Course
5 (A)	NCE 011 – Advanced Foundation Design
5 (B)	NCE 012 – Matrix Analysis of Structures
5 (C)	NCE 013 – Environmental Management for Industries
5 (D)	NCE 014 – Principals of Town Planning and Architecture

Departmental Elective – 2 (Half Unit Course with Credit: 3)

Sl.No.	Code and Course
6 (A)	NCE 021 – Advanced Concrete Design
6 (B)	NCE 022 – Earth and Earth Retaining Structure
6 (C)	NCE 023 – Transportation System and Planning
6 (D)	NCE 024 – Rural Water supply and Sanitation

5.2 NCE – 501: GEOTECHNICAL ENGINEERING

L– 3, T– 1, P- 0
CT–30, TA–20, ESE -100

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton' s pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and c-φ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies.
Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & References Books

1. **V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)**
2. **K.R. Arora – Soil Mechanics and Foundation Engineering**
3. **Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.**
4. **Alam Singh – Modern Geotechnical Engineering**
5. **Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning**
6. **I.H. Khan – Text Book of Geotechnical Engineering**
7. **C. Venkataramaiah – Geotechnical Engineering**
8. **Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics**
9. **G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics**
10. **P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.**
11. **Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering**
12. **Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.**

5.3 NCE – 502: TRANSPORTATION ENGINEERING-I

L-3, T-1, P-0
CT-30, TA-20, ESE-100

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR)

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications,

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Book:

1. **Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.**
2. **Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**

References:

3. **Kadiyali L. R., & Lal, N.B. "Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)", Khanna Publications, Delhi – 110 006**
4. **Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi**
5. **Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.**
6. **Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.**
7. **Chakraborty Partha & Das Animesh., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,**
8. **IRC : 37-2012, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi**

9. IRC: SP:68-2005, "Guidelines for Construction of Roller Compacted Concrete Pavements", Indian Roads Congress, New Delhi.
10. IRC: 58-2011, "Guidelines for The design of Plain Jointed Rigid Pavements for Highways", Indian Roads Congress, New Delhi.
11. IRC: 15-2002, "Standard Specifications and Code of Practice for construction of Concrete Roads" Indian Roads Congress, New Delhi.
12. MORTH, "Specifications for Road and Bridge Works", Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

5.4 NCE – 503 ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1, P -0
CT – 15, TA – 10, ESE – 50

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.
Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.
Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.
Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient

air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books:

1. **Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**
2. **Metcalf & Eddy "Wastewater Engineering: Treatment & Reuse", Tata Mc-Graw Hill.**
3. **Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)**
4. **Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).**
5. **Seinfeld, J.H. and Pandis, S.N. "Atmospheric Chemistry and Physics: From Air Pollution to Climate Change", John Wiley**
6. **http://cpcb.nic.in/, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.**

References:

1. **Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
2. **Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi**
3. **Steel and McGhee: Water Supply and Sewerage**
4. **Fair and Geyer: Water Supply and Wastewater Disposal**
5. **Hammer and Hammer Jr.: Water and Wastewater Technology**
6. **Raju: Water Supply and Wastewater Engineering**
7. **Rao: Textbook of Environmental Engineering**
8. **Davis and Cornwell: Introduction to Environmental Engineering**
9. **Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II**
10. **Punmia: Water Supply and Wastewater Engineering Vol. I and II**
11. **Birdie: Water Supply and Sanitary Engineering**
12. **Ramalho: Introduction to Wastewater Treatment Processes**
13. **Davis Mackenzie L., Cornwell, David A., "Introduction to Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.**

5.5 NCE - 504: STRUCTURAL ANALYSIS-2

L-3, T -1, P-0

CT– 30, TA– 20, ESE- 100

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **Jain, A. K.,"Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.**
2. **Hibbeler, R.C.,"Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309**
3. **C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.**
4. **Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem**
5. **Chand & Bros., Roorkee.**
6. **Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.**
7. **Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.**

8. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
9. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
10. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi..

5.6 NCE - 505: DESIGN OF CONCRETE STRUCTURE-1

L -3, T -1, P-0
CT – 30, TA – 20, ESE - 100

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly
Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.
2. The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. **IS: 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete: Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
4. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
5. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
6. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
7. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**
8. **Sinha, S.N., "Reinforced Concrete Design" Mc-Graw Hill Book Publishing Company Ltd., New Delhi**
9. **Subramanian, N.,"Design of Reinforced Concrete Structures", Oxford University Press,New Delhi – 110 001.**

5.7 NCE – 551: GEOTECHNICAL ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. **Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.**
2. **Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.**
3. **Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.**
4. **Determination of relative density of a given soil sample.**
5. **Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.**
6. **Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).**
7. **Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).**
8. **Determination of compaction characteristics (OMC & MDD) of a given soil sample.**
9. **Determination of permeability of a remolded soil sample by constant head &/or falling head method.**
10. **Determination of consolidation characteristics of a remolded soil sample by an oedometer test.**
11. **Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.**

12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

5.8NCE – 551: TRANSPORTATION ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

LIST OF EXPERIMENTS

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.
10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
2. Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.

3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

5.9 NCE - 553: CAD LAB I

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

5.10 NCE - 553: ESTIMATION COSTING & VALUATION

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., "Estimation and Costing in Civil Engineering (Theory and Practice)", UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, "A Text book of Estimation Costing and Valuation" Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., "Estimating Construction Costs" Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

6.2 NCE- 601 DESIGN OF CONCRETE STRUCTURE II

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References

1. **IS : 456 – 2000, " Code of Practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi.**
2. **Jain, A.K., "Reinforced Concrete : Limit State Design", Nem Chand & Bros., Roorkee.**
3. **Dayaratnam, P, "Limit State Design of Reinforced Concrete Structures" Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.**
4. **Gambhir, M L ,"Fundamentals of Reinforced Concrete", Prentice Hall of India.**
5. **Unnikrishna Pillai, S. & D. Menon, " Reinforced Concrete Design", Tata Mc-Graw Hill Company Limited.**
6. **Jain, O. P. & Jai Krishna, " Plain and Reinforced Concrete", Vol. I & II, Nem Chand & Bros., Rookee.**
7. **Park, R. and T. Pauley," Reinforced Concrete Structures", John Wiley & Sons.**
8. **Dayaratnam, P,"Reinforced Concrete Design", Oxford & IBH.**

6.3 NCE-602: ENVIRONMENTAL ENGINEERING – 2

L – 3, T –1, P-0
CT – 30, TA – 20, ESE - 100

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. Objectives of treatment: Water and wastewater treatment, unit operations and processes and flow sheets.

Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators. Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. Water softening and ion exchange: calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. Primary Treatment: Screens, grit chamber and their design.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc.

Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Other emerging technologies for wastewater treatment: Duckweed pond,

vermiculture, root zone technologies, sequential batch reactor (SBR) etc.
Solid waste Management: Definition of solid waste and its classification, Hazardous waste, Prevailing regulations of solid waste management in India.
Noise Pollution: Definition, Sources, Prevailing noise standards in India.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
5. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban
2. Development, Government of India, New Delhi
3. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Arceivala: Wastewater Treatment for Pollution Control
6. Hammer and Hammer Jr.: Water and Wastewater Technology
7. Raju: Water Supply and Wastewater Engineering
8. Sincero and Sincero: Environmental Engineering: A Design Approach
9. Pandey and Carney: Environmental Engineering
10. Rao: Textbook of Environmental Engineering
11. Davis and Cornwell: Introduction to Environmental Engineering
12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering

6.4 NCE-603: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owing and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira " Construction Planning Equipment and Methods" McGraw Hills Education (India), Private Ltd.,New Delhi.**
2. **Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.**
3. **Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad – 500 004**
4. **Construction Management by Ojha**
5. **Srivastava, U.K.,"Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.**
6. **Construction Technology By Sarkar, Oxford.**

DEPARTMENTAL ELECTIVE – 1 SUBJECT (NCE-011 to NCE-014)

6.5 (A) NCE-011: ADVANCED FOUNDATION DESIGN

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit -1
Modern methods of soil investigations ,Geophysical methods; soil resistivity methods seismic refraction method ,stress below ground due to loads
Unit -2
Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmertman's methods of settlement prediction in non cohesive soil.
Unit -3
Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour, Well sinking, Tilt, shift and their prevention.
Unit -5
Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads ,Machine foundation: classification, definitions, design principle in brief, Barken's method.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & Reference Books:

1. **K. R. Arora – Soil Mechanics & Foundation Engineering.**
2. **Alam Singh – Modern Geotechnical Engineering.**
3. **Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics**
4. **J. E. bowles – Analysis and Design of Foundation.**
5. **V. N. S. Murthy – Soil Mechanics and Foundation Engineering.**
6. **B. M. Das – Foundation Engineering, CENGAGE Learning**

6.5 (B) NCE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE - 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2
Hand computation of problems on trusses, frames and grids.

UNIT – 3
Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Reference:

1. **Weaver & Gere, Matrix Analysis of Framed structures.**
2. **H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill New York**
3. **Pandit, G.S.," Structural Analysis: A Matrix Approach" McGraw Hill Education (India) Pvt. Ltd., Noida.**

6.5(C) NCE – 013: ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw

materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC):Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ.

References:

1. EIA Manuals of MOEF (Available on http://envfor.nic.in/essential-links/eia-specific-manuals and http://envfor.nic.in/division/introduction-8)
2. Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website
3. Environmental Impact Assessment-Training resource manual, UNEP 2001
4. Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,
5. George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
6. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
7. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
8. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

6.5 (D) NCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L – 3, T –1, P-0
CT – 30, TA – 20, ESE – 100

Unit - 1

Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic arid social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.

Unit - 2

An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.

Unit -3

Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.

Unit - 4

Elements of Architectural Design: Line. Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.

Unit - 5

Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
4. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
5. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
6. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
7. Nelson P. Lewis, Planning to Modern City, Routledge.
8. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
11. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
12. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
13. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi
14. National Building Code of India, latest edition

DEPARTMENTAL ELECTIVE –2 SUBJECT (NCE-021 to NCE-024) (Half Unit Course)

6.6 (A) NCE-021: ADVANCED CONCRETE DESIGN

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit - 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.

Unit - 2

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

Unit - 3

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under-concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab and R.C. T-beam types.

Unit - 4

High performance concrete, Production and no -conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Reinforced Concrete Design by M L Gambhir**
2. **Reinforced Concrete Design by B C Punamia**
3. **Essentials of Bridge Engineering by D.J. Victor**

6.6 (B) NCE- 022: EARTH AND EARTH RETAINING STRUCTURE

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis. Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability

Unit -2

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit - 3

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface-friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -4

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **V N S Murthy - Soil Mechanics and Foundation Engg**
2. **Swami Saran - Reinforced Soil and its Engineering Application**
3. **J. E. Bowles - Analysis and Design of Foundation.**
4. **B. M. Das - Foundation Engineering , CENGAGE Learning**
5. **P.C Varghese- Foundation Engineering, PHI Learning Pvt. Ltd., Delhi**
6. **N.N.SOM, S.C.Das, Theory and Practice of Foundation Design, PHI Learning Pvt. Ltd., Delhi**

6.6 (C) NCE-023: TRANSPORTATION SYSTEM AND PLANNING

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Goals and objective of Transportation planning,

UNIT-2-

Type of transportation system: Different modes of surface transport, Public Transport Intermediate Public Transport (IPT), Rapid and mass transport system like MRTS & bus rapid transit. Traffic Flow and traffic stream theory & variables, Queing theory.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **Introduction to Transportation Engineering: William W. Hay.**
2. **Introduction to Transportation Engineering planning- E.K.Mortak.**
3. **Metropolitan Transportation planning-J.W.Dickey.**
4. **Traffic Engineering, L.R. Kadiyali**
5. **Banks, James H., "Introduction to Transportation Engineering", McGraw Education (India), Pvt. Ltd., Noida.**

6.6 (D) NCE-024: RURAL WATER SUPPLY AND SANITATION

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.
Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. **‘Water Treatment and Sanitation – Simple Method for Rural Area’ by Mann H.T. and Williamson D.**
2. **Operation and maintenance of rural water supply and sanitation systems by Brikké F**
3. **‘Water Supply for Rural Areas & Small Communities’ by Wanger E.G. and Lanoix J.N.,**
4. **WHO ‘Water Supply and Sewerage’, by E.W.Steel & T.J.Mcghee, McGraw Hill.**
5. **‘Manual on Water Supply and Treatment’, CPHEEO, Ministry of Urban Development, Govt. of India.**

6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

6.7 NCE- 651: STRUCTURAL DETAILING LAB

L -0, T -0, P -3
CT – 10, TA – 10, ESE – 30

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt. Ltd., Hyderabad.

6.8 NCE-652: ENVIRONMENTAL ENGINEERING LAB

L -0, T -0, P -3
CT – 10, TA – 10, ESE – 30

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM_{10} with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

Note: Any 8 Experiments out of the list of experiments are to be performed.

References:

1. A.P.H.A. “Standard Methods for the Examination of Water and Wastewater”, American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. “Chemistry for Environmental Engineering”, Mc-Graw Hill.
3. Mathur, R.P. “Water & Wastewater Testing”, Lab Manual, Roorkee.

6.9 NCE-653: CAD LAB II

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)
2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.
3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)
4. Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)

6.10NCE-654: SURVEY CAMP

TOTAL MARKS: 50

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map.

The course will be run in the form of a camp for 7 working days and will involve the following components:

1. Reconnaissance of the area to be mapped.
2. Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.
3. Detail digital mapping using Total station/GPS.
4. Preparing a digital map using open source mapping software and report writing.

Note: Teaching load will be equivalent to 0-0-3.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. THIRD YEAR

(CIVIL ENGINEERING)

On

Choice Based Credit System
[Effective from session 2018-19]

FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS501	MANEGIRIAL ECONOMICS	Applied Science	3—0---0	70	20	10	100	3
2	RAS-502/ RUC501	SOCIOLOGY /CYBER SECURITY	Applied Science	3—0---0	70	20	10	100	3
3	RCE501	GEOTECHNICAL ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE502	DESIGN OF STRUCTURE-I	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE503	QUANTITY ESTIMATION AND MANAGEMENT	Core Deptt.	3—0---0	70	20	10	100	3
6	 RCE051 RCE052 RCE053	**ELECTIVE -1** MODERN CONSTRUCTION MATERIALS CONCRETE TECHNOLOGY GEOENVIRONMENTAL	Core Deptt.	3—1--0	70	20	10	100	4

CIVIL ENGINEERING

		ENGINEERING							
7	RCE551	GEOTECHNICAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
8	RCE552	CAD LAB-1	Core Deptt.	0—0---2	50		50	100	1
9	RCE553	CONSTRUCTION MANAGEMENT LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE554	CONCRETE LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

SESSION 2018-19

RCE 501 GEOTECHNICAL ENGINEERING (L-T-P 3-0-0) Credit - 3

Unit 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, sensitivity and thixotropy, Particle size analysis, Unified and Indian standard soil classification system. **[8]**

Unit 2

Soil Hydraulics: Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Darcy's Law, hydraulic conductivity, equivalent hydraulic conductivity in stratified soil. Seepage, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, capillarity, critical hydraulic gradient and quick sand condition, uplift pressure, piping; **[8]**

Unit 3

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

Consolidation: Primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, Contact pressure **[8]**

Unit 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; pore pressure, Skempton's pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine's approaches for frictional and c-φ soils, inclined backfill, Graphical methods of earth pressure determination, Stability of slopes , Culman method & Method of slices, Stability number & chart. **[8]**

Unit 5

Sub surface structure: Bearing capacity of shallow foundations, SPT, Plate load test; Effect of water table.

Deep foundations: Types of piles, Static and dynamic formulae, Pile group, Settlement of Pile Group, Negative skin friction. **[8]**

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, "Soil Mechanics & Foundation Engineering", John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.

4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
10. P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
12. Gulati, S.K., "Geotechnical Engineering" McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 502 DESIGN OF STRUCTURE 1 **(L-T-P 3-1-0) Credit- 4**

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint by Slope-Deflection method, Moment Distribution method and Strain Energy method. **[8]**

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged and fixed arches, Influence line diagrams for maximum bending moment, Shear force and thrust in two hinge arches. Analysis of two and three hinged stiffening girders. **[8]**

Unit – 3

Introduction to Suspension Bridges, Analysis of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders. **[8]**

Unit – 4

Basic Force and Displacement Matrix method for analysis of beams, frames and trusses. **[8]**

Unit – 5

Basics of Plastic Analysis. Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Single Storied Frames. **[8]**

References:

1. Jain, A. K., "Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C., "Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.

4. Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
5. Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.
6. Wang, C. K. " Intermediate Structural Analysis", Mc Graw-Hill Book Publishing Company Ltd.
7. Thandavamoorthy, T.S., "Structural Analysis" Oxford University Press, New Delhi.
8. Martin, H. C." Introduction to Matrix Methods of Structural Analysis", Mc-Graw Hill Book Publishing Company Ltd, New Delhi.
9. Mau, "Introduction to Structural Analysis" CRC Press Taylor & Francis Group.
10. Ghali, " Structural Analysis: A Unified Classical and Matrix Approach" 5/e, CRC Press Taylor & Francis Group.
11. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.
12. Vazirani & Ratwani et al , "Analysis of Structures", Khanna Publishers
13. Coates, RC, Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.
14. SP Gupta & Gupta "Theory of Structure Vol.1 & 2" TMH
15. DS Prakash Rao "Structural Analysis: A Unified Approach" Universities Press.
16. S Ramamurtham "Theory of Structure" Dhanpat Rai.
17. Devdas Menon "Advanced Structural Analysis" Narosa
18. Hsieh, "Elementary Theory of Structures" 4/e, Pearson Education, Noida.
19. Mckenzie, "Examples in Structural Analysis" 2/e, CRC Press Taylor & Francis Group.
20. R Agor, Structural Analysis, " Khanna Book Publishing.
21. Jacques Heyman, "Structural Analysis" Cambridge University Press.

RCE 503 QUANTITY ESTIMATION & MANAGEMENT (L-T-P 3-0-0) Credit - 3

UNIT I: Quantity Estimation for Buildings

Measurement units for various building materials, Centreline method, Long and short wall method of estimates, PWD schedule of rate, Delhi schedule of rate. **[8]**

UNIT II: Rate Analysis, Specification and Tenders

Analysis of rates knowing cost of material, labour, equipment, overheads, profit, taxes etc, Specifications – Preparation of detailed and general specifications, Legal aspects of contracts, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering, pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items. **[8]**

UNIT III: Elements of Management & Network Techniques

Project cycle, Organization, planning, scheduling, monitoring, updating and management system in construction, Bar charts, milestone charts, work break down structure and preparation of networks. Network Techniques like PERT & CPM in construction management. Project monitoring and resource allocation through network techniques. **[8]**

UNIT IV: Equipment Management

Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipment for earth moving, earth compaction, Hauling Equipment, Hoisting Equipment, Conveying Equipment, Concrete Production Equipment, Tunnelling Equipment **[8]**

UNIT V: Project Cost Management

Budgeting, Cost planning, Direct Cost, Indirect cost, Total Cost Curve, Cost Slope. Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison, present worth method Equivalent annual cost method, discounted cash flow method, Depreciation and break even cost analysis. **[8]**

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., "Civil Engineering Contracts and Estimates" University Press India, Pvt. Ltd. Hyderabad –500 004

4. Construction Management by Ojha

5. Srivastava, U.K., "Construction Planning and Management", Galgotia Publications Pvt. Ltd., New Delhi.

6. Construction Technology by Sarkar, Oxford

7. Delhi Schedule of Rates (latest version)

8. S V Deodhar and SC Sharma, "Costruction Engineering and Management, Khanna Publishing house.

RCE 051 MODERN CONSTRUCTION MATERIALS (L-T-P 3-0-0) Credit - 3

Unit – 1

Introduction, properties and uses of modern building materials: fly ash bricks, soil - cement blocks, calcium silicate bricks, red mud jute fibre polymer composite (RFPC) , glass reinforced gypsum. **[8]**

Unit – 2

Introduction , properties and use of: geosynthetics, bituminous material, fire resistant materials (chemicals ,paints ,tiles ,bricks, glass),metals, light - weight concrete, mass concrete, waste material based concrete. **[8]**

Unit – 3

Introduction , properties and use of: Ferro cement & fibre reinforced concrete, different types of fibres, high density concrete, Nuclear concrete, heat resisting & refractory concretes, pre fabricated systems. **[8]**

Unit – 4

Introduction , properties and use of: Polymers, fibre reinforced polymers, polymer concrete composites (PCCs), sulphur concrete and sulphur - infiltrated concrete. **[8]**

Unit – 5

Introduction , properties and use of: Conventional and modern water proofing materials, Conventional and modern insulating materials(thermal, sound and electrical insulating materials).Concept of polymer floor finishes. **[8]**

Reference Book:

1) Ghambhir M.L."Concrete Technology" Tata McGraw Hill education private Limited.
2) A.R. Santhakumar, Concrete Technology, Oxford University Press.
3) Building Materials, P.C. Varghese, Prentice-Hall India.
4) Shetty, M. S., "Concrete Technology" S. Chand Publication.
5) Krishnaraju .N., Advanced Concrete Technology, CBS Published.
6) Materials Science and Engineering: An introduction, W.D. Callister, John Wiley.
7) Nevile. A.M., Concrete Technology, Prentice Hall, Newyork.
8) Dr. U. K. Shrivastava, Building Materials Technology, Galgotia Publication pvt.ltd.
9) Materials Science and Engineering, V. Raghavan, Prentice Hall.
10) Properties of Engineering Materials, R.A. Higgins, Industrial Press.
11) Construction materials: Their nature and behaviour, Eds. J.M. Illston and P.L.J. Domone, 3rd ed., Spon Press.
12) The Science and Technology of Civil Engineering Materials, J.F. Young, S. Mindess, R.J. Gray & A. Bentur, Prentice Hall.
13) Engineering Materials 1: An introduction to their properties & applications, M.F. Ashby and D.R.H. Jones, Butterworth Heinemann.
14) The Science and Design of Engineering Materials, J.P. Schaffer, A. Saxena, S.D. Antolovich, T.H. Sanders and S.B. Warner, Irwin.
15) Concrete: Microstructure, properties and materials, P.K. Mehta and P.J.M. Monteiro, McGraw Hill.
16) S K Sharma, "Civil Engineering and construction material," Khanna Publuishing House.
17). Properties of concrete, A.M. Neville, Pearson.

RCE 052 CONCRETE TECHNOLOGY (L-T-P 3-0-0) Credit - 3

Unit I

Cement: production, composition properties, types and cement chemistry. Introduction to supplementary cementitious materials. Aggregates: mineralogy, properties, test and standards. Quality of water for use in concrete. **[8]**

Unit II

Introduction & study of accelerators, retarders, water reducers, air entrainers , water proofers, super plasticizers. Study of supplementary cementing materials like fly ash, silica fume , ground granulated blast furnace slag, metakaoline and pozzolana; their production, properties and effect on concrete properties . **[8]**

Unit III

Principle of mix proportioning, properties related to mix design, Mix design method (IS method and ACI method). Mix design of concrete: packing density, Rheology, mix design examples. **[8]**

Unit IV

Concert production, batching, mixing and transportation of concrete. Workability: test for work ability of concrete (slump test, compacting factor test and Vee Bee test). Segregation and bleeding in concrete, curing of concrete and its methods. Determination of compressive and flexural strength as per BIS. Mechanical properties of concrete: elastic modules , poisson's ratio, creep, shrinkage and durability of concrete . **[8]**

Unit V

Study and uses of high strength concrete, self compacting concrete, fiber reinforced concrete, ferro cement, ready Mix Concrete, recycled aggregate concrete and status in India. **[8]**

References

1. Neville, A.M. and Brooks, J.J.," CONCRETE TECHNOLOGY", ELBS.
2. Shetty, M.S, "Concrete Technology, Theory and Practice", S. Chand and Company Ltd, New Delhi, 2008.
3. Gambhir, M.L, "Concrete Technology", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2004.
4. Santha kumar, A.R; "Concrete Technology" , Oxford University Press, New Delhi, 2007.
5. Gupta B.L., Amit Gupta, "Concrete Technology", Jain Book Agency, 2010.
6. Newman, K., "CONCRETE SYSTEMS in COMPOSITE MATERIALS".EDT BY L.Holliday. Elsevier Publishing Company. 1966.
7. Popovics. S., "FUNDAMENTALS OF PORTLAND CEMENT CONCRETE: A Quantitative Approach VOL 1 FRESH CONCRETE" JOHN WILEY & SONS.1982.

8. P.K. Mehta and Paulo J.M. Monteiro, "Concrete: microstructure, properties and materials", The Mc Graw Hill Companies.
9. Jayant D. Bapat (2013), Mineral admixtures in cement and concrete, Taylor and Francis group.
10. Concrete mix proportioning as per IS 10262:2009 – Comparison with IS 10262:1982 and ACI 211.1-91 M.C. Nataraja and Lelin Das
11. IS10262-1982 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1998.
12. IS456-2000 Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards, New Delhi, 2000.

RCE 053 GEOENVIRONMENTAL ENGINEERING (L-T-P 3-0-0) Credit - 3

UNIT-1 Fundamentals of Geoenvironmental Engineering

Scope of geoenvironmental engineering - multiphase behaviour of soil – role of soil in geoenvironmental applications – importance of soil physics, soil chemistry, hydrogeology, biological process – sources and type of ground contamination – impact of ground contamination on geoenvironment - case histories on geoenvironmental problems. **[8]**

UNIT-2 Soil-Water-Contaminant Interaction

Soil mineralogy characterization and its significance in determining soil behaviour – soil-water interaction and concepts of double layer, forces of interaction between soil particles, concepts of unsaturated soil, water flow in saturated and unsaturated zone, soil-water-contaminant interactions and its implications, factors effecting retention and transport of contaminants. **[8]**

UNIT-3 Waste Containment System

Evolution of waste containment facilities and disposal practices, Site selection based on environmental impact assessment ,different role of soil in waste containment, different components of waste containment system and its stability issues , property evaluation for checking soil suitability for waste containment . **[8]**

UNIT-4 Contaminant Site Remediation

Site characterization, risk assessment of contaminated site, remediation methods for soil and groundwater, selection and planning of remediation methods. **[8]**

UNIT-5 Advanced Soil Characterization

Contaminant analysis, water content and permeability measurements, electrical and thermal property evaluation, use of GPR for site evaluation, introduction to geotechnical centrifuge modeling. **[8]**

Text

1. Yong, R. N., "Geoenvironmental Engineering, Contaminated Soils, Pollutant Fate, and Mitigation" CRC Press, New York, 2001.
2. Sharma H.D. and Reddy K.R., "Geoenvironmental Engineering: Site Remediation, Waste Containment, and Emerging Waste Management Technologies" John Wiley & Sons, Inc., USA, 2004.
3. Fredlund D.G. and Rahardjo, H., "Soil Mechanics for Unsaturated Soils" Wiley-Interscience, USA, 1993.
4. Mitchell, J. K., "Fundamentals of Soil Behaviour" Wiley, 2005.
5. Hillel D., "Introduction to Environmental Soil Physics" Academic Press, New York, 2003.
6. Rowe R.K., "Geotechnical and Geoenvironmental Engineering Handbook" Kluwer Academic Publications, London, 2000.
7. Reddi L.N. and Inyang, H. I., "Geoenvironmental Engineering, Principles and Applications" Marcel Dekker Inc. New York, 2000.

References

1. Hillel D., "Introduction to Soil Physics" Academic Press, New York, 1982.
2. Sparks, D.L., "Environmental Soil Chemistry" Academic Press, New York, 2002.
3. Bagchi, A., "Design of landfills and integrated solid waste management" John Wiley & Sons, Inc., USA, 2004.
4. O.P. Gupta, Elements of Environmental Chemistry, Khanna Publishing House
5. Alvarez-Benedi J. and Munoz-Carpena, R., "Soil-Water-Solute Process Characterization: An Integrated Approach" CRC Press, New York, 2005.
6. Berkowitz, B. Dror, I. and Yaron, B., "Contaminant Geochemistry" Springer, Germany, 2008.
7. Mohamed, A. M. O., "Principles and Applications of Time Domain Electrometry in Geoenvironmental Engineering" Taylor and Francis, New York, 2006.
8. O P Gupta, Elements of land and soil pollution, Khanna Publishing House

RCE-551 GEOTECHNICAL ENGINEERING LAB (L-T-P 0-0-2) Credit- 1

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Determination of shear strength of soil by Direct shear test.

8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remoulded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remoulded soil sample by an odometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.
12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

References:

1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.

RCE 552 CAD LAB 1 **(L-T-P0-0-2) Credit- 1**

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

RCE 553 CONSTRUCTION MANAGEMENT LAB **(L-T-P 0-0-2) Credit-1**

1. Estimation of quantities for any one of the following: Building/ Septic tank/Water supply pipe line/road/bridge.
2. Preparation of Bill of Quantities (BOQ) for above project.
3. Practice of MS Project/Primavera software for same problem.
4. Study of any full set of tender documents (Institute shall provide the set from ongoing/ completed tenders).

These exercises will be done through use of software and spread in 8-10 classes.

References:

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003

2. Srinath, L.S., "PERT and CPM Principals and applications" Affiliated East-West Press Pvt. Ltd., New Delhi.

3. Patil, B.S., “Civil Engineering Contracts and Estimates” University Press India, Pvt. Ltd. Hyderabad –500 004
4. Construction Management by Ojha
5. Srivastava, U.K., “Construction Planning and Management”, Galgotia Publications Pvt. Ltd., New Delhi.
6. Construction Technology by Sarkar, Oxford
7. S V Deodhar and SC Sharma, " Contruction engineering and Management", Khanna Publishing House.
7. Delhi Schedule of Rates (latest version)

RCE 554 CONCRETE LAB **(L-T-P 0-0-2) Credit- 1**

1. Study of IS codes for (i) Aggregates (ii) Cements (iii) Admixtures (iv) Fly ash
2. Concrete Mix design computation by ACI 211.1-91 method, IS code method as per 10262-2007 & 456-2000, DOE method for given sample.
3. Preparation and testing of samples as per any one of the above mentioned computations (Minimum grade of concrete is M30)
4. Tests on Concrete- (a) Workability tests - Slump cone test, compaction factor test, Vee-bee consistometer test, flow table test. (b) Strength tests- compressive strength, flexural strength, split tensile strength.
5. Effects of Admixture - Accelerator, Retarder, Super Plasticizer.
6. Non destructive Testing - Rebound Hammer test, Ultrasonic Pulse Velocity test.

References:

1. Concrete Technology – A.M. Neville & J. J. Brooks , Pearson
2. Concrete Technology Theory & Practice-M.S. Shetty, S. Chand Publishers
3. Concrete Technology Theory & Practice-M.L. Gambhir, TMH Publishers
4. IS:10262-2009-Concrete Mix Proportioning Guidelines

SIXTH SEMESTER

CIVIL ENGINEERING

SESSION 2018-19

Sl No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA.		
1	RAS601	INDUSTRIAL MANAGEMENT	Applied Science	3—0---0	70	20	10	100	3
2	RUC601/ RAS602	CYBER SECURITY/SOCIOLOGY	Applied Science	3—0---0	70	20	10	100	3
3	RCE601	DESIGN OF STRUCTURE-II	Core Deptt.	3—0---0	70	20	10	100	3
4	RCE602	ENVIRONMENTAL ENGINEERING	Core Deptt.	3—1---0	70	20	10	100	4
5	RCE603	TRANSPORTATION ENGINEERING	Core Deptt.	3—0---0	70	20	10	100	3
6	RCE061 REC062 RCE063	**ELECTIVE -2** FOUNDATION DESIGN INTEGRATED WASTE MANAGEMENT FOR A SMART CITY GEOSYNTHESIS AND REINFORCED SOIL STRUCTURES	Core Deptt.	3—1---0	70	20	10	100	4
7	RCE651	CAD LAB-2	Core Deptt.	0—0---2	50		50	100	1
8	RCE652	ENVIRONMENTAL ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
9	RCE653	TRANSPORTATION ENGINEERING LAB	Core Deptt.	0—0---2	50		50	100	1
10	RCE 654	STRUCTURAL DETAILING LAB	Core Deptt.	0—0---2	50		50	100	1
	TOTAL				620	120	260	**1000**	**24**

RCE 601 DESIGN OF STRUCTURE -II (L-T-P 3-0-0) Credits - 3

Unit – 1

Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method. Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method. **[8]**

Unit – 2

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear.

Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments. **[8]**

Unit – 3

Design of one way, One way continuous and cantilever solid slabs by Limit State Design Method, Design of RCC staircases.

Design of lintels and chajjas. Design of two way slabs by limit state method, Serviceability Limit States, Control of deflection, cracking and vibrations. **[8]**

Unit – 4

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts. **[8]**

Unit – 5

Structural behaviour of footings, Design of isolated footings, combined rectangular and trapezoidal footings by Limit State Method, Design of strap footings.

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of cantilever retaining wall by Limit State Method. **[8]**

References

1. IS: 456 – 2000.

2. Reinforced Concrete Design by S. U. Pillai & D. Menon, Tata Mc.- Graw, New Delhi

3. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.

4. Reinforced Concrete Vol. - II by H.J. Shah, Charotar Publisher, Gujarat.

5. RCC Designs (Reinforced Concrete Structures) by B.C. Punmia, Ashoka Kumar Jain and Arun Kumar Jain, Laxmi Publishers, New Delhi.

6. Reinforced Concrete Structures by R. Park and Pauley.

7. Reinforced Concrete Design by P. Dayaratnam.

8. Reinforced Concrete Design by M.L. Gambhir
9. Reinforced Concrete Design by S.N. Sinha , TMH
10. Plain and Reinforced Concrete Vol. I & II by O.P. Jain & Jai Krishna, Nem Chand & Bros.
11. SP-16: Design Aid to IS- 456.

RCE 602 ENVIRONMENTAL ENGINEERING (L-T-P 3-1-0) Credit - 4

Unit-I

Fresh water, water demands, variation in demands, population forecasting by various methods, basic needs and factors affecting consumption, design period.

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control. **[8]**

Unit-2

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Capacity of distribution reservoirs: general design guidelines for distribution system. **[8]**

Unit-3

Physical, chemical and bacteriological examination of water and wastewater: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. quality requirements, standards of water and waste water, disposal of wastewater on land and water bodies. **[8]**

Unit-4

Objectives of water treatment: unit operations, processes, and flow sheets.

Water treatment: screening, sedimentation, determination of settling velocity, efficiency of ideal sedimentation tank, design of settling tanks, grit chamber.

Primary sedimentation and coagulation, filtration: theory of filtration; hydraulics of filtration; slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: requirements of an ideal disinfectant; various disinfectants, chlorination and practices of chlorination, water softening and ion-exchange process **[8]**

Unit-5

Objectives of waste water treatment: unit operations, processes, and flow sheets.

Secondary and tertiary treatment: secondary sedimentation and theory of organic matter removal.

Working of activated sludge process, trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, rotating biological contactors (RBC).

Anaerobic digestion of sludge: design of low and high rate anaerobic digesters and septic tank. Working of up flow anaerobic sludge blanket (UASB) reactor and other emerging technologies for wastewater treatment **[8]**

Text Books:

1. Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, “Environmental Engineering” McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Metcalf & Eddy “Wastewater Engineering: Treatment & Reuse”, Tata Mc-Graw Hill.
3. M. P. Poonia and SC Sharma: Environmental Engineering, kahnna publishing house
4. Keshav Kant, "Air Pollution Control Engineering", Khanna Publishing House
5. OP Gupta, Elements of Environmental Polluton Control, Khanna Publication
6. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Hammer and Hammer Jr.: Water and Wastewater Technology
6. Raju: Water Supply and Wastewater Engineering
7. Rao: Textbook of Environmental Engineering
8. Davis and Cornwell: Introduction to Environmental Engineering
9. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
10. Punmia: Water Supply and Wastewater Engineering Vol. I and II
11. Birdie: Water Supply and Sanitary Engineering
12. Ramalho: Introduction to Wastewater Treatment Processes
13. Davis Mackenzie L., Cornwell, David A., “Introduction to Environmental Engineering” McGraw Hill Education (India) Pvt. Ltd., New Delhi.
14. Birdie: Water Supply and Sanitary Engineering
15. Ramalho: Introduction to Wastewater Treatment Processes
16. Parker: Wastewater Systems Engineering
17. A.K. Jain, Environmental Engineering, Khanna Publishing House

RCE 603 TRANSPORTATION ENGINEERING (L-T-P 3-0-0) Credit- 3

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan,

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, **[8]**

UNIT-2

Geometric Design(IRC:73-Latest revision): Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. **[8]**

UNIT-3

Traffic Engineering: Traffic Characteristics, Traffic studies on flow, speed, travel time - delay and O-D study, PCU, peak hour factor, parking study, accident study and analysis, traffic capacity, density, traffic control devices: signs, Island, signal design by Webster's and IRC method . Intersection at grade and grade separated intersections, design of roundabouts as per IRC: 65-2017. Highway capacity and level of service of rural highways and urban roads as per latest IRC recommendation **[8]**

UNIT-4

Highway Materials: Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications, Design of Highway Pavement : Types of Pavements, Design factors, Design of bituminous paving mixes; Design of Flexible Pavement by CBR method (IRC : 37- Latest revision), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2015) **[8]**

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB),Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads. **[8]**

Note: All designs and procedure are to be done with reference to latest revision of IRC as given below in reference section

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. "Highway Engineering", Nem Chand and Bros., Roorkee- 247 667.
2. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
3. LR Kadiyali, Transportation Engineering, Khanna Publication.

References:

1. L.R. Kadiyali, Transportation Engineering, Khanna Publishing House
2. Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi
3. Kumar, R Srinivasa, "A Text book of Highway Engineering", Universities Press, Hyderabad.
4. Kumar, R Srinivasa, "Pavement Design", Universities Press, Hyderabad.

5. Chakraborty Partha & Das Animesh., “Principles of Transportation Engineering”, Prentice Hall (India), New Delhi,
6. IRC : 37- Latest revision, “Tentative Guidelines for the design of Flexible Pavements” Indian Roads Congress, New Delhi
7. IRC:58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Fourth Revision) (with CD)
8. IRC:65-2017 Guidelines for Planning and Design of Roundabouts (First Revision)
9. IRC:73-1980 Geometric Design Standards for Rural (Non-Urban) Highways
10. IRC:106-1990 Guidelines for Capacity of Urban Roads in Plain Areas
11. IRC:93-1985 Guidelines on Design and Installation of Road Traffic Signals.
12. IRC:92-2017 Guidelines for Design of Interchanges in Urban Areas (First Revision)
13. IRC: SP: 68-2005, “Guidelines for Construction of Roller Compacted Concrete Pavements”, Indian Roads Congress, New Delhi.
14. IRC: 15-2002, “Standard Specifications and Code of Practice for construction of Concrete Roads” Indian Roads Congress, New Delhi.
15. MORTH, “Specifications for Road and Bridge Works”, Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

RCE 061 FOUNDATION DESIGN (L-T-P 3-0-0) Credit – 3

UNIT-1

Introduction to soil exploration, methods of boring and drilling, soil sampling and sampler, in-situ tests, SPT, CPT, DCPT, geophysical methods; soil resistivity methods seismic refraction methods. **[8]**

UNIT-2

Bearing capacity of shallow foundation, design criteria, factors affecting bearing capacity, factors influencing selection of depth of foundation, modes of shear failures, types of shallow foundations, contact pressure under rigid and flexible footings, Terzaghi’s, Meyerhof, Hansen’s bearing capacity theories, IS code method

Settlement of shallow foundations: components of settlement & its estimation, immediate, consolidation, & differential settlements. **[8]**

UNIT-3

Design of shallow foundation; principles of design of footing, design of isolated footings and strip footing.

Deep foundation; introduction, necessity of deep foundations, pile installation, pile groups, group action of piles in sand and clay, group efficiency of piles, settlement of piles, negative skin friction, single and double under reamed piles. **[8]**

UNIT-4

Introduction, shapes and characteristics of wells, components of well foundation, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts.

Retaining walls: introduction, types of retaining structures, support systems for flexible retaining walls (struts, anchoring), construction methods, introduction and uses of sheet piles. **[8]**

UNIT-5

Geotechnical properties of reinforced soil, use of soil reinforcement, shallow foundation on soil with reinforcement, design considerations, idealized soil, foundation and interface behaviour, elastic models of soil behaviour. **[8]**

Reference Books:

1) Alamsingh; Soil Mechanics & Foundation Engineering; CBS Publishers & Distributors, Delhi
2) Taylor D.W.; Fundamentals of Soil Mechanics; Asia Publishing House, Mumbai
3) Das Braja M; Principles of Geotechnical Engineering; Thomson Asia Pvt. Ltd.
4) Joseph E. Bowles: Foundation analysis and design. McGraw-Hill Higher Education
5) Gopal Ranjan, Rao A.S.R.; Basic and applied soil mechanics; New age int. (p) ltd.
6) Arora K.R.; Soil Mechanics & Foundation Engineering; Standard Pub., Delhi
7) B.C. Punamia; Soil Mechanics & Foundation Engineering; Laxmi Pub. Pvt. Ltd., Delhi.
8) V. N. S. Murthy; Soil Mechanics & Foundation Engineering; Sai Kripa Technical Consultants, Banglore
9) P. Purushothama Raj; Soil Mechanics and Foundation Engineering; Pearson Education.
10) I.H. Khan – Text Book of Geotechnical Engineering
11) C. Venkataramaiah – Geotechnical Engineering
12) Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
13) Gulati, S.K., “Geotechnical Engineering” McGraw Hill Education (India), Pvt. Ltd., Noida.

RCE 062 INTEGRATED WASTE MANAGEMENT FOR A SMART CITY

(L-T-P 3-0-0) Credit - 3

Unit-1

Introduction: Solid Waste Management- Definition, Concept of 4Rs (reduce, reuse, recycle and recover) of waste management, Elements of a waste management system, Current Issues in Solid Waste Management, Integrated Waste Management Hierarchy: Source reduction, Recycling, Waste-to-Energy and Land filling. Review of waste management under Swachh Bharat Mission and Smart Cities Program. **[8]**

Unit-2

Municipal Solid Waste: Waste Composition and Quantities**,** Collection, Transportation, Segregation, and Processing. **[8]**

Unit-3
Disposal of Municipal Solid Waste: Landfill, Biochemical Processes and Composting, Energy Recovery from Municipal Solid Waste. Municipal Solid Waste (MSW) Rules 2016. **[8]**

Unit-4
Construction and Demolition (C&D) Waste Management: Overview, Components; C&D Waste Management Rules 2016, Beneficial Reuse of C & D Waste Materials. **[8]**

Unit-5
Electronic Waste (E-Waste) Management – Issues and Status in India and Globally, E-Waste Management Rules 2016 and Management Challenges.

Hazardous Wastes: Definition, Classification, Risk assessment, Transportation of hazardous waste, Current Management Practices: Environmental audit, Containment, Remedial alternatives. **[8]**

Books:
1. George Tchobanoglous, Hilary Theisen and Samuel A Vigil, Integrated Solid Waste management, Tata McGraw Hill
2. Ramachandra T.V., *Management of Municipal Solid Waste*, 2009; by The Energy and Resource Institute, TERI
3. Sasikumar, K, Gopi Krishna, Sanoop, *Solid Waste Management*; 2009, PHI.

References:
1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization(CPHEEO), India
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website
3. Construction and Demolition Waste Management Rules, 2016, MoEF&CC
4. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website.
5. O P Gupta, " Element of Solid waste hazardous management, Khanna Publishing house.
6. Freeman, M. H.1988. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Book Company, New York
7. http://swachhbharatmission.gov.in/sbmcms/index.htm
8. http://swachhbharaturban.gov.in/

RCE 063 GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES

(L-T-P 3-0-0) Credit - 3

UNIT 1
Introduction to Geosynthetics, types of geosynthetics, artificial and natural geosythetics and their applications, manufacture of geosynthetics, strength of reinforced soils, testing of Geosynthetics. **[8]**

UNIT-2

Drainage application of geosynthetics , filtration applications of geosynthetics, erosion control using geosynthetics geosyntheitcs in flexible payment, introduction to geosyenthitcs in landfills, geosynthetics for construction of landfills **[8]**

UNIT-3

Sustainable infrastructure development, different types of soil retaining structures, design codes for reinforced soil retaining walls, construction aspects of geosythetics reinforced soil retaining wall, testing requirements for reinforced soil retaining walls, geosynthetic reinforced soil embankments. **[8]**

UNIT-4

Design of reinforced soil retaining walls – simple geometry, design of reinforced soil retaining walls – sloped backfill soil, soil embankments supported on geocell mattresses, geosynthetic reinforced pile systems for high embankments **[8]**

UNIT-5

Reinforced soil for supporting shallow foundations, response of footings resting on reinforced foundation soils, bearing capacity analysis of footings resting on reinforced foundation soils, carbon footprint analysis **[8]**

REFERENCES

1. Koerner, R.M. "Designing with Geosynthetics", Prentice Hall, New Jersey, USA, 4th edition, 1999.
2. Jewell, R.A., "Soil Reinforcement with Geotextiles", Special Publication No. 123, CIRIA, Thomas Telford. London, UK, 1996.
3. Geosynthetics - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.
4. Hoe I. Ling, Guido Gottardi , Daniele Cazzuffi , Jie Han , Fumio Tatsuoka "Design and Practice of Geosynthetic-Reinforced Soil Structures"
5. Sanjay Kumar Shukla, Erol Guler "Advances in Reinforced Soil Structures"

RCE 651 CAD LAB- 2 **(L-T-P 0-0-2) Credit - 1**

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)
2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.

3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)

RCE 652 ENVIRONMENTAL ENGINEERING LAB (L-T-P 0-0-2) Credit -1

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM10 with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total , suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of a nearby area.

Note: 1. Experiment at S.NO. 14 is mandatory.

2. Any 8 Experiments out of the S.NO 1 to 13 are to be performed.

References:

1. A.P.H.A. "Standard Methods for the Examination of Water andWastewater", American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. "Chemistry for Environmental Engineering", Mc-Graw Hill.
3. Mathur, R.P. "Water & Wastewater Testing", Lab Manual, Roorkee.
4. O P Gupta, Environmental Chemistry, " Khanna Publishing house.

RCE 653 TRANSPORTATION ENGINEERING LAB (L-T-P 0-0-2) Credit - 1

1. To Determine the Crushing Value of Coarse Aggregates.
2. To Determine the Impact Value of Coarse Aggregates.
3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.
4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.
5. To determine the Stripping Value of Coarse Aggregates.
6. To determine the penetration Value of Bitumen.
7. To determine the Softening Point of Bituminous material.
8. To determine the Ductility Value of Bituminous material.
9. To determine the Flash and Fire Point of Bituminous material.

10. To determine the Stripping Value of Bituminous material.
11. Classified both directional Traffic Volume Study.
12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).
13. Determination of CBR Value of soil sample in the Lab or in Field.

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

1. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.
2. Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.
3. Duggal, Ajay K., Puri, Vijay P.," Laboratory Manual in Highway Engineering" New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., " Laboratory Manual on Concrete Technology" CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

RCE 654 STRUCTURAL DETAILING LAB (L-T-P 0-0-2) Credit - 1

1. Study of SP34/IS13920/IS456:2000 for detailing of structural elements.
2. Preparation of working hand sketches and Auto CAD drawings for the following-
   - RC Beams- Simply supported, Continuous, Cantilever
   - T – beam / L-beam floor
   - Slabs – Simply supported, Continuous, One way and two way slabs.
   - Columns – Tied Columns and Spirally reinforced columns.
   - Isolated footings for RC Columns.
   - Combined rectangular and trapezoidal footings.
3. Preparation of bar bending schedule
4. Detailing of Buildings with respect to Earthquake Resistant Design
5. Study of full set of structural drawing of a building as made available by Institute.

References: Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt.Ltd., Hyderabad.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

2nd , 3rd and 4th Year

[Effective from session 2009-10]

1. **B. Tech. Mechanical Engineering**
2. **B. Tech. Production Engineering**
3. **B. Tech. Industrial & Production Engineering**
4. **B. Tech. Mechanical & Industrial Engineering**

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / Aeronautical Engineering

[Effective Form session 2009-10]

YEAR II, SEMESTER-III

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.					
			L	T	P	CT	TA	Total	ESE		
		THEORY									
1.	EHU-301/ EHU-302	Industrial Psychology / Industrial Sociology	2	0	0	15	10	25	50	75	2
2	EAS-301 / EOE-031- EOE 038	Mathematics-III / Science Based Open Elective***	3	1	0	30	20	50	100	150	4
3.	ECE-301	Fluid Mechanics** *Engineering Core (interdisciplinary)*	3	1	0	30	20	50	100	150	4
4.	EME301	Materials Science in Engineering	3	1	0	30	20	50	100	150	4
5.	EME-302	Strength of Materials	3	1	0	30	20	50	100	150	4
6.	EME-303	Thermodynamics	2	1	0	15	10	25	50	75	3
7.	*EHU-111*	**Human Values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
		PRACTICAL/TRAINING/PROJECT									
8.	EME-351	Material Science & Testing Lab	0	0	2	10	10	20	30	50	1
9.	EME-352	Machine Drawing-I	0	0	3	10	10	20	30	50	1
10.	EME-353	Thermodynamics Lab	0	0	2	10	10	20	30	50	1
11.	ECE-351	Fluid Mechanics Lab *	0	0	2	10	10	20	30	50	1
12.	GP-301	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**5**	**9**	**-**	**-**	**-**	**-**	**1000**	**26**

NOTE: Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).

Paper Code	**Science Based Open-Electives**
EOE-031/EOE-041	Introduction to Soft Computing (Neural Networks, Fuzzy Logic and Genetic Algorithm)
EOE-032/EOE-042	Nano Sciences
EOE-033/EOE-043	Laser System and Applications
EOE-034/EOE-044	Space Science
EOE-035/EOE-045	Polymer Science & Technology
EOE-036/EOE-046	Nuclear Science
EOE-037/EOE-047	Materials Science
EOE-038/EOE-048	Discrete Mathematics

**Common to Civil Engg. and Mechanical Engg & related branches *(as Engineering Core – Interdisciplinary).*

*Human values & Professional Ethics will be offered as a compulsory audit course for which passing marks are 40% in theory & 50% in aggregate. Students will be required to audit it with in the period of their study. There will not carry over facility for this course and the failure student will be required to repeat this course (in next-semester).

Note : Mechanical Engineering & related branches students cannot take the Open Elective Course EOE-037/EOE-047: Materials Science.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering / Manufacturing Technology / Automobile Engineering / Aeronautical Engineering

[Effective from Session 2009-10]

YEAR II, SEMESTER-IV

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY											
1.	EHU-402/ EHU-401	Industrial Sociology / Industrial Psychology	2	0	0	15	10	25	50	75	2
2.	EOE-041- EOE-048/ EAS-401	Science Based Open Elective*** / Mathematics-III	3	1	0	30	20	50	100	150	4
3.	EEE-409	Electrical Machines & Automatic Control *Engineering Core (interdisciplinary)*	3	1	0	30	20	50	100	150	4
4.	EME-401	Applied Thermodynamics	3	1	0	30	20	50	100	150	4
5.	EME-402	Manufacturing Science-I	3	1	0	30	20	50	100	150	4
6.	EME-403	Measurement & Metrology	2	1	0	15	10	25	50	75	3
7	*EHU-111*	**Human values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
PRACTICAL/TRAINING/PROJECT											
8.	EME-451	Machine Drawing-II	0	0	3	10	10	20	30	50	1
9.	EME-452	Manufacturing Science-I Lab	0	0	3	10	10	20	30	50	1
10.	EME-453	Measurement & Metrology Lab	0	0	2	10	10	20	30	50	1
11.	EEE-459	Electrical Machines & Automatic Control Lab	0	0	2	10	10	20	30	50	1
12.	GP-401	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**5**	**10**	**-**	**-**	**-**	**-**	**1000**	**26**
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20010-11]
YEAR III, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
		THEORY									
1.	EHU-501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
2.	EME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
3.	EME-502	Theory of Machines-I	3	1	0	30	20	50	100	150	4
4.	EME-503	Manufacturing Science-II	3	1	0	30	20	50	100	150	4
5.	EME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
6.	EPI-501	Production Planning & Control	2	1	0	15	10	25	50	75	3
7	*EHU-111*	**Human values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
		PRACTICAL/TRAINING/PROJECT									
8	EME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
9.	EME 552	Seminar	0	0	3	-	50	-	-	50	1
10.	EME 553	Manufacturing Science-II Lab	0	1	2	10	10	20	30	50	1
11.	EME 554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**7**	**10**	**-**	**-**	**-**	**-**	**1000**	**26**

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering
[Effective from Session 2010-11]
YEAR III, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
	THEORY										
1.	EHU-501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
2.	EME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
3.	EME-502	Theory of Machines-I	3	1	0	30	20	50	100	150	4
4.	EME-503	Manufacturing Science-II	3	1	0	30	20	50	100	150	4
5.	EME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
6.	EME-505	I.C. Engines & Compressors	2	1	0	15	10	25	50	75	3
7	*EHU-111*	**Human values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
	PRACTICAL/TRAINING/PROJECT										
8	EME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
9.	EME 552	Seminar	0	0	3	-	50	-	-	50	1
10.	EME 553	Manufacturing Science-II Lab	0	1	2	10	10	20	30	50	1
11.	EME 554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**7**	**10**	**-**	**-**	**-**	**-**	**1000**	**26**

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20011-12]
YEAR III, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
		THEORY									
1.	EHU-601	Industrial Management	3	0	0	30	20	50	100	150	3
2.	EME-011 to EME-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
3.	EME-021 to EME-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
4.	EME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
5.	EME-603	Theory of Machine- II	2	1	0	15	10	25	50	75	3
6.	EPI-601	Principles of Machine Tool Design	3	1	0	30	20	50	100	150	4
7	*EHU-111*	**Human values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
		PRACTICAL/TRAINING/PROJECT									
8.	EME-651	Fluid Machinery Lab	0	1	2	10	10	20	30	50	1
9.	EME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
10.	EME-653	Theory of Machines Lab	0	0	3	10	10	20	30	50	1
11.	EPI-651	Machine Tool Design Lab	0	0	2	10	10	20	30	50	1
12.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**6**	**9**	**-**	**-**	**-**	**-**	**1000**	**26**
		Industrial Training-II of 4 – 6 weeks after VI semester will be evaluated in VII semester									

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. EME-011 Fluid Machinery
2. EME-012 Unconventional Manufacturing Processes
3. EME-013 Product Development & Design
4. EME-014 Reliability Engineering

Department Elective - II

1. EME-021 Non-Conventional Energy Resources & Utilization
2. EME-022 Advanced Welding Technology
3. EME-023 Optimization Techniques in Engineering
4. EME-024 Mechanical Vibrations

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering
[Effective from Session 2010-11]
YEAR III, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
	THEORY										
1.	EHU-601	Industrial Management	3	0	0	30	20	50	100	150	3
2.	EME-011 to EME-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
3.	EME-021 to EME-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
4.	EME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
5.	EME-603	Theory of Machine- II	2	1	0	15	10	25	50	75	3
6.	EME-604	Refrigeration & Air-conditioning	3	1	0	30	20	50	100	150	4
7	*EHU*	**Human values & Professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
		PRACTICAL/TRAINING/PROJECT									
8.	EME-651	Fluid Machinery Lab	0	1	2	10	10	20	30	50	1
9.	EME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
10.	EME-653	Theory of Machines Lab	0	0	3	10	10	20	30	50	1
11.	EME-654	Refrigeration & Air Conditioning Lab	0	0	2	10	10	20	30	50	1
12.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**16**	**6**	**9**	**-**	**-**	**-**	**-**	**1000**	**26**
		Industrial Training-II of 4 – 6 weeks after VI semester will be evaluated in VII semester									

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

DEPARTMENTAL ELECTIVES:

Department Elective - I

5. EME-011 Fluid Machinery
6. EME-012 Unconventional Manufacturing Processes
7. EME-013 Product Development & Design
8. EME-014 Reliability Engineering

Department Elective - II

5. EME-021 Non-Conventional Energy Resources & Utilization
6. EME-022 Advanced Welding Technology
7. EME-023 Optimization Techniques in Engineering
8. EME-024 Mechanical Vibrations

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20011-12]

YEAR IV, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
		THEORY									
1.	EOE-071-EOE-074	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	EME-031 to EME-036	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EME-041 to EME-046	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
4.	EME-701	Computer Aided Design	3	1	0	30	20	50	100	150	4
5.	EME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
6	*EHU-111*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	
		PRACTICAL/TRAINING/PROJECT									
7.	EME-751	CAD/CAM Lab	0	1	2	10	10	20	30	50	1
8.	EME-752	I.C.Engine & Automobile Lab	0	0	2	10	10	20	30	50	1
9	EME-753	Project	0	0	3	-	50	50	-	50	2
10	EME-754	Industrial Training I & II Evaluation and viva-	0	0	2		50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**6**	**9**	**-**	**-**	**-**	**-**	**1000**	**26**

Note-***Practical Training-1 & 2 (4-weeks each) done after 4th & 6th Semesters would be evaluated in 7th semester through Report and viva voice etc.

* Project should be initiated in 7th semester beginning, and should be completer by the end of 8th semester with good Report and power-point Presentation etc.

Paper Code	**Open Electives – I**
EOE-071	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operations Research
EOE-074	Introduction to Biotechnology

DEPARTMENTAL ELECTIVES:

Department Elective - III

1. EME-031 Computer Aided Manufacturing
2. EME-032 Project Management
3. EME-033 Advanced Fluid Mechanics
4. EME-034 Experimental Stress Analysis
5. EME-035 Advanced Dynamics of Machines
6. EME-036 Management Information System

Department Elective - IV

1. EME-041 Total Quality Management
2. EME-042 Thermal Turbo Machines
3. EME-043 Mechanical System Design
4. EME-044 Tribology
5. EME-045 Industrial Ergonomics
6. EME-046 Concurrent Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20011-12]
YEAR IV, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.					
			L	T	P	CT	TA	Total	ESE		
	THEORY										
1.	EOE-081-EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EME-051-EME-056	Departmental Elective - V	3	1	0	30	20	50	100	150	4
3.	EME-061-EME-066	Departmental Elective – VI	3	1	0	30	20	50	100	150	4
4.	EPI-801	Quality Control	3	1	0	30	20	50	100	150	3
7	*EHU-111*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	-
	PRACTICAL/TRAINING/PROJECT										
6.	EME-851	Project	0	0	12	-	100	100	250	350	8
10.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**3**	**12**	-	-	-	-	**1000**	

Paper Code	**Open Electives – II**
EOE-081	Non Conventional Energy Resources
EOE-082	Nonlinear Dynamic Systems
EOE-083	Product Development
EOE-084	Automation and Robotics

DEPARTMENTAL ELECTIVES:

Department Elective-V

1. EME-051 Operations Research
2. EME-052 Maintenance Engineering & Management
3. EME-053 Design of Thermal Systems
4. EME-054 Advanced Synthesis of Mechanisms
5. EME-055 Six Sigma Methods & Applications
6. EME-056 Concepts of Modern Physics

Department Elective-VI

1. EME-061 Finite Element Method
2. EME-062 Non-Destructive Testing
3. EME-063 Advanced Materials Technology
4. EME-064 Production & Operations Management
5. EME-065 Energy Management
6. EME-066 Fundamentals of Bio Medical Engineering

Note: (1) The students who had taken Open elective EME-073 Operations Research in VII Sem. can not take the course EME-051 Operations Research as a Departmental Elective in VIII Sem.

(2) The students who had taken departmental elective EME 021 Non Conventional Energy Resources & Utilization in VI Sem. can not take the open elective course EOE-081 Non Conventional Energy Resources in VIII Semester.

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering
[Effective from Session 2011-12]
YEAR IV, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credits
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
		THEORY									
1.	EOE-081-EOE-084	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EME-051 to EME-056	Departmental Elective - V	3	1	0	30	20	50	100	150	4
3.	EME-061 to EME-066	Departmental Elective – VI	3	1	0	30	20	50	100	150	4
4.	EME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	3
7	*EHU*	**Human values & professional Ethics*	*2*	*0*	*0*	*15*	*10*	*25*	*50*	*75*	-
		PRACTICAL/TRAINING/PROJECT									
6.	EME-851	Project	0	0	12	-	100	100	250	350	8
10.	GP-601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**3**	**12**	-	-	-	-	**1000**	

Paper Code	**Open Electives – II**
EOE-081	Non Conventional Energy Resources
EOE-082	Nonlinear Dynamic Systems
EOE-083	Product Development
EOE-084	Automation and Robotics

DEPARTMENTAL ELECTIVES:

Department Elective-V

7. EME-051 Operations Research
8. EME-052 Maintenance Engineering & Management
9. EME-053 Design of Thermal Systems
10. EME-054 Advanced Synthesis of Mechanisms
11. EME-055 Six Sigma Methods & Applications
12. EME-056 Concepts of Modern Physics

Department Elective-VI

7. EME-061 Finite Element Method
8. EME-062 Non-Destructive Testing
9. EME-063 Advanced Materials Technology
10. EME-064 Production & Operations Management
11. EME-065 Energy Management
12. EME-066 Fundamentals of Bio Medical Engineering

Note: (1) The students who had taken Open elective EME-073 Operations Research in VII Sem. can not take the course EME-051 Operations Research as a Departmental Elective in VIII Sem.

(2) The students who had taken departmental elective EME 021 Non Conventional Energy Resources & Utilization in VI Sem. can not take the open elective course EOE-081 Non Conventional Energy Resources in VIII Semester.

	L	T	P
EAS-301/EAS-401: MATHEMATICS –III	**3**	**1**	**0**

Unit – I : Function of Complex variable

Analytic function, C-R equations, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic function, Taylor's and Laurent's series, singularities, Residue theorem, Evaluation of real integrals of the type $\int_0^{2\pi} f(Cos\,\theta, Sin\,\theta)\,d\theta$ and $\int_{-\infty}^{+\infty} f(x)\,dx$ **10**

Unit – II : Statistical Techniques - I

Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves etc., Correlation, Linear, non –linear and multiple regression analysis, Probability theory. **08**

Unit – III : Statistical Techniques - II

Binomial, Poisson and Normal distributions, Sampling theory (small and large), Tests of significations: Chi-square test, t-test, Analysis of variance (one way) , Application to engineering, medicine, agriculture etc.

Time series and forecasting (moving and semi-averages), Statistical quality control methods, Control charts, $\bar{X}$, R, p, np, and c charts. **08**

Unit – IV : Numerical Techniques – I

Zeroes of transcendental and polynomial equation using Bisection method, Regula-falsi method and Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, difference tables, Newton's forward and backward interpolation , Lagrange's and Newton's divided difference formula for unequal intervals. **08**

Unit – V : Numerical Techniques –II

Solution of system of linear equations, Gauss- Seidal method, Crout method. Numerical differentiation, Numerical integration , Trapezoidal , Simpson's one third and three-eight rules, Solution of ordinary differential (first order, second order and simultaneous) equations by Euler's, Picard's and forth-order Runge- Kutta mehthods. **08**

Test Books :-

1. Peter V. O'Neil, Advance Engineering Mathematics Thomson (Cengage) Learning, 2007.
2. Jain, Iyenger & Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi , 2003.
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.,2000

Reference Books :-

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House, 2002.
2. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya, 1996.
3. E. Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
5. Devi Prasad, An introduction to Numerical Analysis, Narosa Publication house, New Delhi 2006.

6. T. Veerajan & T. Ramchandrandran, Theory & Problems in Numerical Methods, TMH, New Delhi, 2004.
7. S.P.Gupta, Statistical Methods, Sultan and Sons, New Delhi, 2004.
8. Devore, Probability and Statistics, Thomson(Cengage) Learning, 2007.
9. Walpole, Myers, Myers & Ye, Probability and Statistics for Engineers & Scientists, Pearson Education, 2003.

ECE-301: FLUID MECHANICS

L	T	P
3	1	0

I Introduction :

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

II Kinematics of Fluid flow :

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential, source, sink, doublet and half-body.

III Fluid Statics :

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

IV Dynamics of Fluid Flow :

Euler's Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

V Dimensional Analysis and Hydraulic Similitude :

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance, geometric, kinematics and dynamic similarity, model studies.

VI Laminar and Turbulent Flow :

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and networks.

VII Boundary Layer Analysis :

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

References :

1. S Narasimhan : First Course in Fluid Mechanics , University Press
2. Som, S.K. & Biswas G. : Introduction of fluid mechanics & Fluid Machines, TMH, 2000, 2nd edition.
3. M M Das : Fluid Mechanics & Turbomachines , Oxford University Press
4. S.K.Agarwal : Fluid Mechanics & Machinery, TMH
5. Garde, R.J., " Fluid Mechanics through Problems", New Age International Pvt. Ltd, New Delhi, 2nd Edition.
6. Hunter Rouse, "Elementary Mechanics of Fluids", John Wiley & Sons. Omc. 1946
7. I.H.Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education, 1988.
8. Fluid Mechanics by Jagdish Lal
9. Vijay Gupta and S.K.Gupta, " Fluid Mechanics and its Applications", Wiley Eastern Ltd, 1984.
10. Modi, P.N., and Seth, S.H., "Hydrualics and Fluid Machines", Standard Book House, 1989.

EME- 301 : MATERIAL SCIENCE IN ENGINEERING

L T P
3 1 0

Unit-I

Introduction : Historical perspective, importance of materials. Brief review of modern & atomic concepts in Physics and Chemistry. Atomic models, Periodic table, Chemical bondings. 4

Crystallography and Imperfections : Concept of unit cell space lattice, Bravais lattices, common crystal structures, Atomic packing factor and density. Miller indices. X-ray crystallography techniques. Imperfections, Defects & Dislocations in solids. 3

Unit-II

Mechanical properties and Testing : Stress strain diagram, Ductile & brittle material, Stress vs strength. Toughness, Hardness, Fracture, Fatigue and Creep. Testings such as Strength testings, Hardness testing, Impact testings, Fatigue testing Creep testing, Non-destructive testing (NDT) 4

Microstructural Exam : Microscope principle and methods. Preparation of samples and Microstructure exam and grain size determination. Comparative study of microstructure of various metals & alloys such as Mild steel, CI, Brass. 2

Phase Diagram and Equilibrium Diagram : Uniary and Binary diagrams, Phase rules. Types of equilibrium diagrams: Solid solution type, eutectic type and combination type. Iron-carbon equilibrium diagram. 4

Unit-III

Ferrous materials : Brief introduction of iron and steel making furnaces. Various types of carbon steels, alloy steels and cast irons, its properties and uses. 3

Heat Treatment : Various types of heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening. Time Temperature Transformation (TTT) diagrams. 2

Non-Ferrous metals and alloys : Non-ferrrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications. Various type Brass, Bronze, bearing materials, its properties and uses. Aluminum alloys such as Duralumin. Other advanced materials/alloys. 3

Unit-IV

Magnetic properties : Concept of magnetism - Dia, para, ferro Hysteresis. Soft and hard magnetic materials, Magnetic storages. 2

Electric properties : Energy band concept of conductor, insulator and semi-conductor. Intrinsic & extrinsic semi-conductors. P-n junction and transistors. Basic devices and its application. Diffusion of Solid. 3

Super conductivity and its applications. Messier effect. Type I & II superconductors. High Tc superconductors. 2

Unit-V

Ceramics : Structure types and properties and applications of ceramics. Mechanical/Electrical behavior and processing of Ceramics. 2

Plastics : Various types of polymers/plastics and its applications. Mechanical behavior and processing of plastics. Future of plastics. 2

Other materials : Brief description of other material such as optical and thermal materials concrete, Composite Materials and its uses. Brief introduction to Smart-materials & Nano-materials and their potential applications 3

Performance of materials in service: Brief theoretical consideration of Fracture, Fatigue, and Corrosion and its control. 2

References :

1. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesley Publication .
2. K.M.Gupta, Materials Science, Umesh Publication.
3. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.
4. V. Raghvan - Material Science, Prentice Hall.
5. Narula - Material Science, TMH.
6. Srivastava, Srinivasan - Science of Materials Engineering, NewAge Publication..

EME- 302 STRENGTH OF MATERIALS **L T P**
3 1 0

UNIT-I

Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle. 3

3-D Stress, Theory of failure, Castinglion's Theorem, Impact load: Three-dimensional state of stress & strain, equilibrium equations. Generalized Hook's Law. Theories of Failure. Castigliano's Theorem. Impact load & stresses. 5

UNIT –II

Stresses in Beams: Review of pure Bending**.** Direct and shear stresses in beams due to transverse and axial loads, composite beams. 2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams. 4

Torsion: Review of Torsion, combined bending & torsion of solid & hollow shafts. 2

UNIT-III

Helical and Leaf Springs: deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs. 4

Columns and Struts: Combined bending and direct stress, middle third and middle quarter rules. Struts with different end conditions. Euler's theory and experimental results, Ranking Gardon Formulae, Examples of columns in mechanical equipments and machines. 4

UNIT-IV

Thin cylinders & spheres: Hoop and axial stresses and strain. Volumetric strain. 2

Thick cylinders: Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stresses in rotating shaft and cylinders. Stresses due to interference fits.

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression. 4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis(for symmetry about both axis and about one axis) for I-section and channel-section. 4

Books :

1. Mechanics of Materials by Pytel
2. Strength of Materials by Ryder
3. Strength of Materials by Timoshenko and & Yσungs
4. Mechanics of Materials by Bear Jhonson

EME-303 : THERMODYNAMICS

L T P
2 1 0

Unit – I:

Fundamental Concepts and Definitions: Introduction and definition of thermodynamics, Dimensions and units, Microscopic and Macroscopic approaches, Systems, surroundings and universe, Concept of continuum, Control system boundary, control volume and control surface, Properties and state, Thermodynamic properties, Thermodynamic path, process and cycle, Thermodynamic equilibrium, Reversibility and irreversibility, Quasi static process, Energy and its forms, Work and heat, Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases. 3

Zeroth law of thermodynamics: Zeroth law of thermodynamics, Temperature and its' measurement, Temperature scales. 1

First law of thermodynamics: Thermodynamic definition of work, Thermodynamic processes, Calculation of work in various processes and sign convention, Non-flow work and flow work, Joules' experiment, First law of thermodynamics, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. First law analysis for closed system (non flow processes), Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer, Limitations of first law of thermodynamics, PMM-I. 4

Unit – II:

Second law: Devices converting heat to work, Thermal reservoir, Heat engines, Efficiency, Devices converting work to heat, Heat pump, refrigerator, Coefficient of Performance, Reversed heat engine, Kelvin Planck statement of second law of thermodynamics, Clausius statement of second law of thermodynamics, Equivalence of two statements of second law of thermodynamics, Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it's corollaries, thermodynamic temperature scale, PMM-II. 4

Unit – III

Entropy : Clausius inequality, Concept of Entropy, Entropy change in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics. 4

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function. 3

Unit – IV

Properties of steam and thermodynamics cycles: Pure substance, Property of steam, Triple point, Critical point, Sub-cooled liquid, Saturation states, Superheated states, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T & P-V diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Mollier charts, Dryness factor and it's measurement, processes involving steam in closed and open systems. Simple Rankine cycle. 5

Introduction to working of IC engines: Compression Ignition engines, Spark Ignition engines, 2 stroke and 4 stroke engines, Performance parameters of IC engine, Heat balance sheet. 2

Books:

1. Engineering Thermodynamics by Jones and Dugans, PHI Learning Pvt. Ltd.
2. Fundamentals of Thermodynamics by Sonntag, Wiley India Pvt. Ltd.
3. Fundamentals of Classical Thermodynamics by Van Wylen, John wiley & sons.
4. Thermodynamics by J.P. Holman, McGraw Hill.
5. Engineering Thermodynamics by P.K.Nag, Tata Mc Graw Hill Pub.
6. Engineering Thermodynamics by Onkar Singh, New Age International Pub..
7. Thermal Engineering By R.K. Rajput, Laxmi Publication.
8. Engineering Thermodynamics by C.P. Arora.

EME- 351 : MATERIALS SCIENCE AND TESTING Labs

L T P
0 0 3

(A). Material Science Lab Experiments : (at least 5 of the following)

1. Making a plastic mould for small metallic specimen.
2. Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.
3. Grain Size determination of a given specimen.
4. Comparative study of microstructures of different given specimens (mild steel, gray C.I., brass, copper etc.)
5. Heat treatment experiments such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after.
6. Material identification of, say, 50 common items kept in a box.
7. Faradays law of electrolysis experiment.
8. Study of corrosion and its effects.
9. Study of microstructure of welded component and HAZ. Macro & Micro Examination.
10. Suitable experiment on Magnetic/ Electrical/Electronic materials.

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(B). Material Testing Lab Experiments : (at least 5 of the following)

1. Strength testing of a given mild steel specimen on UTM with full details and s-e plot on the machine.
2. Other tests such as shear, bend tests on UTM.
3. Impact testing on impact testing machine like Charpy, Izod or both.
4. Hardness testing of given specimen using Rockwell and Vickers/Brinell testing machines.
5. Spring index testing on spring testing machine.
6. Fatigue testing on fatigue testing machine.
7. Creep testing on creep testing machine.
8. Deflection of beam experiment, comparison of actual measurement of deflection with dial gauge to the calculated one, and or evaluation of young's modulus of beam.
9. Torsion testing of a rod on torsion testing machine.
10. Study of non-destructive testing methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.

EME – 352: MACHINE DRAWING-I LAB

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Introduction (1 drawing sheet)

Graphics Language, Classification of drawings, Principles of drawing, IS codes for machine drawing, scales, types of lines, section lines, Dimensioning **2**

Orthographic Projections (1 drawing sheet)

Principle of first angle and third angle projection, drawing of machine elements in first angle projection, selection of views, sectional views **2**

Screwed fasteners (2 drawing sheet)

Thread nomenclature, Forms of thread, Thread series, designation, Representation of threads, Bolted joints, Locking arrangement of nuts **2**

Keys and Cotters and Pin joint (1 drawing sheet) **2**

Types of keys, Cotter joint or Knuckle joint

Shaft Couplings (1 drawing sheet) **2**

Introduction, Rigid coupling or Flexible coupling

Riveted joints (1 drawing sheet)

Introduction, rivets and riveting, Types of rivet heads, Types of riveted joints, Boiler joint **1**

Assembly Drawing (1 drawing sheet)

Introduction, Engine parts-stuffing box, cross head **1**

Free hand sketching*

Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

* students may be asked to submit the free hand sketching assignment at the end of the semester

Books and References:

1. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy-New Age
2. Machine Drawing-PS Gill-SK Kataria & sons
3. Machine Drawing-N. Siddeshswar, P Kannaiah, VVS Shastry, Tata McGraw Hill
4. Engineering drawing Practice for School and Colleges, SP46-1988 (BIS)

EME-353 : THERMODYNAMICS LAB

L T P
0 0 2

Experiments : Minimum 10 experiments out of following;

1. Study of Fire Tube boiler
2. Study of Water Tube boiler
3. Study and working of Two stroke petrol Engine
4. Study and working of Four stroke petrol Engine
5. Determination of Indicated H.P. of I.C. Engine by Morse Test
6. Prepare the heat balance for Diesel Engine test rig
7. Prepare the heat balance sheet for Petrol Engine test rig
8. Study and working of two stroke Diesel Engine
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine
11. Study of Pressure compounded steam turbine
12. Study of Impulse & Reaction turbine
13. Study of steam Engine model.
14. Study of Gas Turbine Model
15. Any other suitable experiment on thermodynamics

ECE-351 : Fluid Mechanics Lab

L T P
0 0 2

1. To verify the momentum equation using the experimental set-up on diffusion of submerged air jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter, venturimeter, and bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
5. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
6. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
7. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.

EEE – 409 : ELECTRICAL MACHINES & AUTOMATIC CONTROL

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UNIT I:–

Single phase Transformer: Efficiency Voltage regulation, O.C.& S.C. Tests. **2**

Three Phase Transformer: Three phase transformer connections, 3-phase to 2-phase or 6-phase connections and their applications. **2**

Auto Transformer: Volt- Amp relations, efficiency, advantages & disadvantages, applications. **1**

D.C. Motors: Concept of starting, speed control, losses and efficiency. **3**

UNIT II:

Three phase Induction Motor: Construction, equivalent circuit, torque equation and torque- slip characteristics, speed control. **3**

Alternator: Construction, e.m.f. equation, Voltage regulation and its determination by synchronous impedance method. **3**

Synchronous Motor: Starting, effect of excitation on line current (V-curves), synchronous condenser. **2**

Servo Motor: Two phase a.c. servo motor & its application. **1**

UNIT III:

Modeling of Mechanical System: linear mechanical elements, force-voltage and force current analogy, electrical analog of simple mechanical systems; concept of transfer function & its determination for simple systems. **4**

Control System: Open loop & closed loop controls, servo mechanisms; concept of various types of system. **2**

Signals: Unit step, unit ramp, unit impulse and periodic signals with their mathematical representation and characteristics**.** **1**

UNIT IV:

Time Response Analysis: Time response of a standard second order system and response specifications, steady state errors and error constants. **2**

Stability: Concept and types of stability, Routh Hurwitz Criterion and its application for determination of stability, limitations; Polar plot, Nyquist stability Criterion and assessment of stability. **6**

UNIT V:

Root Locus Techniques: Concept of root locus, construction of root loci.

Frequency Response Analysis: Correlation between time and frequency responses of a second order system; Bode plot, gain margin and phase margin and their determination from Bode and Polar plots. **4**

Process control: Introduction to P,PI and PID controllers their characteristics, representation and applications. **1**

Text Book:

1. I. J. Nagrath & D. P. Kothari, "Electrical machines" Tata McGraw Hill.
2. B.R. Gupta & Vandana Singhal, "Fundamentals of Electrical Machines", New Age International.
3. K. Ogata, "Modern Control Engineering" Prentice Hall of India.
4. B.C. Kuo, "Automatic Control systems." Wiley India Ltd.

Reference Books:

5. Irvin L. Kosow, "Electric Machinery and Transformers" Prentice Hall of India.
6. D. Roy Choudhary, "Modern Control Engineering" Prentice Hall of India.
7. M. Gopal, Control Systems: Principles and Design" Tata McGraw Hill.

EME-401 APPLIED THERMODYNAMICS

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Unit-I

Thermodynamic relations: Mathematical conditions for exact differentials. Maxwell Relations, Clapeyron Equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic & Isothermal compressibility. 3

Fuels and Combustion: Combustion analysis, Heating Values, Air requirement, Air/Fuel ratio, Standard heat of Reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature. 4

Unit-II

Boilers: Steam generators-classifications. Working of fire-tube and water-tube boilers, boiler mountings & accessories, Draught & its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance. 6

Condenser: Classification of condenser, Air leakage, Condenser performance parameters 2

Unit-III

Steam Engines: Rankine and modified Rankine cycles, Working of stream engine, Classification of steam engines, Indicator diagram, Saturation curve, Missing quantity, Heat balance. 3

Steam& Gas Nozzles: Flow through nozzle, Variation of velocity, Area and specific volume, Choked flow, Throat area, Nozzle efficiency, Off design operation of nozzle, Effect of friction on nozzle, Super saturated flow. 4

Unit-IV

Vapour Power cycles: Carnot vapour power cycle, Effect of pressure & temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, Combined cycles, Cogeneration. 3

Steam Turbines : Classification of steam turbine, Impulse and reaction turbines, Staging, Stage and overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple & compound multistage impulse & reaction turbines & related calculations work done efficiencies of reaction, Impulse reaction Turbines, state point locus, Comparison with steam engines, Losses in steam turbines, Governing of turbines. 4

Unit-V

Gas Turbine: Gas turbine classification Brayton cycle,Principles of gas turbine, Gas turbine cycles with intercooling,reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles. 4

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turboprop engines & their processes, Principle of rocket propulsion, Introduction to Rocket Engine. 3

Books:

1. Applied thermodynamics by Onkar Singh, New Age International (P) Publishers Ltd.
2. Basic and Applied Thermodynamics by P.K. Nag, Tata Mc Graw Hill Pub.
3. Thermal Engg. By P.L. Ballaney, Khanna Publisher
4. Theory of Stream Turbine by W.J. Kearton
5. Steam & Gas Turbine by R.Yadav, CPH Allahabad
6. Thermal Engg. By R.K. Rajput, Laxmi Publication
7. Gas Turbine, by V. Ganeshan, Tata Mc Graw Hill Publishers.
8. Gas turbine Theory & Practice, by Cohen & Rogers, Addison Weslay Long man

EME- 402 : MANUFACTURING SCIENCE-I

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Unit-I

Introduction :

Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items. 2

Metal Forming Processes :

Elastic & plastic deformation, yield criteria. Hot working vs cold working. 2

Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging 5

Unit-II

Metal Forming Processes (continued):

Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. 3

Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. 2

Design, lubrication and defects in metal forming processes. 2

Unit-III

Sheet Metal working :

Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs Piercing. Compound vs Progressive die. Flat-face vs Inclined-face punch and Load(capacity) needed. 4

Analysis of forming process like cup/deep drawing. Bending & spring-back. 3

Unit-IV

Unconventional Metal forming processes :

Unconventional metal forming processes such as explosive forming, electro-magnetic, electro-hydraulic forming. 2

Powder Metallurgy :

Powder metallurgy manufacturing process. The need, process, advantage and applications. 2

Jigs & Fixtures :

Locating & Clamping devices & principles. Jigs and Fixtures and its applications. 2

Manufacturing of Plastic components :

Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives. 2

Unit-V

Casting (Foundry)

Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting,. Sand casting, defects & remedies and inspection. Cupola furnace. 7

Die Casting, Centrifugal casting. Investment casting, CO_2 casting and Stir casting etc. 3

Books :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by P.C. Pandey

3. Production Technology by R.K. Jain
4. Manufacturing Technology by P.N. Rao., TMH
5. Materials and Manufacturing by Paul Degarmo.
6. Manufacturing Science by KM Moeed.
7. Manufacturing Engineering & Technology by Kalpakjian, Pearson Pub.

EME -403 : MEASUREMENT AND METROLOGY

L T P
2 1 0

Unit-I

Mechanical Measurements

Introduction: Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors. 4

Sensors and Transducers:

Types of sensors, types of transducers and their characteristics. 2

Signal transmission and processing:

Devices and systems. 2

Signal Display & Recording Devices 1

Unit-II

Time related measurements:

Counters, stroboscope, frequency measurement by direct comparison. 1

Measurement of displacement 1

Measurement of pressure:

Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures. 1

Strain measurement:

Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration. 2

Measurements of force and torque:

Different types of load cells, elastic transducers, pneumalic & hydraulic systems. 1

Temperature measurement:

Thermometers, bimetallic thermocouples, thermistors and pyrometers. 2

Vibration:

Seismic instruments, vibration pick ups and decibel meters, vibrometers accelerometers. 2

Unit-III:

Metrology

Metrology and Inspection :

Standards of linear measurement, line and end standards. Limit fits and tolerances. Interchangeability and standarisation. 2

Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator. 2

Limit gauges classification, Taylor's Principle of Gauge Design. 1

Unit-IV

Measurement of geometric forms like straightness, flatness, roundness. 2
Tool makers microscope, profile project autocollimator. 1
Interferometry: principle and use of interferometry, optical flat. 2
Measurement of screw threads and gears. 1
Surface texture: quantitative evaluation of surface roughness and its measurement. 1

Measurement and Inspection: Dimensional inspection – Tolerance, Limit gauging, comparators, Surface roughness, Feature inspection.

Total 33

References

1. Beckwith Thomas G., Mechanical Measurements, Narosa Publishing House, N. Delhi.
2. Doeblein E.O., "Measurement Systems, Application Design", McGraw Hill, 1990.
3. Kumar D.S., "Mechanical Measurements and Control", Metropolitan, N. Delhi.
4. Hume K.J., "Engineering Metrology", MacDonald and Co. 1963
5. Gupta, I.C., "Engineering Metrology", Dhanpat Rai & Sons, New Delhi, 1994
6. Sirohi, "Mechanical Measurement" New Age Publishers
7. Jain, R.K., "Engineering Metrology" Khanna Publishers
8. Jain, R.K., "Mechanical Measurement" Khanna Publishers

EME – 451 : MACHINE DRAWING-II LAB

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Review of Orthographic Projections (1 drawing sheet)
Orthographic Projection of solids in First angle of projection, missing lines views, interpretation of views **2**

Part and Assembly Drawing (2 drawing sheet)
Assembly drawing of eccentric, lathe tail stock, air valve, screw jack, connecting rod, safety valve etc. **2**

Specification of Materials (1 drawing sheet)
Engineering materials, representation, Code designation of steel, copper, aluminium etc. 1

Limits, Tolerance and Fits (1 drawing sheet)
Limit system, Tolerances, Method of placing limit dimensions, Fits-types **2**

Surface Roughness (1 drawing sheet)
Introduction, nomenclature, machining symbols, indication of surface roughness **1**

Production Drawing (1drawing sheet)
Types, Examples of simple machine elements like helical gear, bevel gear, crank, connecting rod, belt pulley, piston etc. **2**

Computer Aided Drafting (2 drawings)
Introduction, input, output devices, introduction to software like AutoCAD, ProE, basic commands and development of 2D and 3D drawings of simple parts **3**

Books and References:

1. Machine Drawing - KL Narayana, P Kannaiah, KV Reddy - New Age
2. Machine Drawing - PS Gill - SK Kataria & sons
3. Machine Drawing -N. Siddeshswar, P Kannaiah, VVS Shastry -Tata McGraw Hill
4. Engineering Drawing - RK Dhawan - S. Chand
5. AutoCAD-S. Vshal - Dhanpat Rai
6. Engineering Graphics - BK Goel & PK Goel - SK Kataria
7. Computer Aided Engineering Graphics - Rajashekhar Patil - New Age
8. Engineering Drawing - Dhananjay A Jolhe - Tata McGraw Hill
9. Engineering Drawing - CM Agrawal - Tata McGraw Hill
10. Machine Drawing – Ajeet Singh – The Mc Graw Hill Companies

EME-452 : **MANUFACTURING SCIENCE-1 LAB** **L T P**

0 0 3

Experiments :
Say minimum 8 experiments out of following (or such experiment).

1. Design of pattern for a desired casting (containing hole)
2. Pattern making
3. Making a mould (with core) and casting.
4. Sand testings (at least one such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging hand forging processes
7. Forging - power hammer study & operation
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.
12. Bending & spring back.
13. Powder metallurgy experiment.
14. Jigs & Fixture experiment.
15. Any other suitable experiment on manufacturing science / process / technique.

EME 453: MEASUREMENT & METROLOGY LAB **L T P**
0 0 2

Experiments: Minimum 8 out of following (or such experiments)

1. Study & working of simple measuring instruments- Vernier calipers, micrometer, tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire method.
3. Measurement of angle using sinebar & slip gauges. Study of limit gauges.
4. Study & angular measurement using level protector
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Study and understanding of limits, fits & tolerances
9. Study of Pressure & Temperature measuring equipment.
12. Strain gauge measurement.
13. Speed measurement using stroboscope.
14. Flow measurement experiment
15. Vibration/work measuring experiment.
16. Experiment on Dynamometers.

EEE – 459 : ELECTRICAL MACHINES & AUTOMATIC CONTROL LAB

L T P
0 0 2

Note: To perform at least 7 experiments of Electrical Machines and 3 experiments of Automatic Control System

A. <u>Electrical Machines</u>

1. To obtain speed-torque characteristics and efficiency of a dc shunt motor by direct loading.
2. To obtain efficiency of a dc shunt machine by no load test.
3. To obtain speed control of dc shunt motor using (a) armature voltage control (b) field control.
4. To determine polarity and voltage ratio of single phase and three phase transformers.
5. To obtain efficiency and voltage regulation by performing O.C. and S.C. tests on a single phase transformer at full load and 0.8 p.f. loading.
6. To obtain 3-phase to 2-phase conversion using Scott connection.
7. To perform load test on a 3-phase induction motor and determine

(a) speed- torque characteristics (ii) power factor v/s line current characteristics.

8. To study speed control of a 3-phase induction motor using (a) Voltage Control

(b) Constant (Voltage/ frequency) control.

9. To perform open circuit and short circuit test on a 3-phase synchronous machine and determine voltage regulation at full load and unity, 0.8 lagging and 0.8 leading power factor using synchronous impedance method.
10. To determine V-curve of a 3-phase synchronous motor at no load, half load and full load.

B. <u>Automatic Control System</u>:

1. To determine transient response of a second order system for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To determine speed – torque characteristics of an a.c. 2-phase servo motor.
4. To study and calibrate temperature using Resistance Temperature Detector(RTD)
5. To study dc servo position control system within P and PI configurations.
6. To study synchro transmitter and receiver system and determine output V/s input characteristics.
7. To study open loop and closed loop control of a dc separately excited motor.

EME-501 : MACHINE DESIGN-I

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UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads **3**

Design against Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure **4**

UNIT II

Design against Fluctuating Loads

Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria **4**

Riveted Joints-Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint **4**

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity **4**

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings-Design of rigid and flexible couplings **4**

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading **4**

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack **3**

Note: Design data book is allowed in the examination

Books and References:

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebers-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Machine design-M.F. Spott, Prentice Hall India
4. Machine Design-Maleev and Hartman, CBS
5. Machine design -Black & Adams, Mc Graw Hill
6. Machine Design-Sharma and Agrawal, S.K. Katara & Sons
7. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.

EME 502 : THEORY OF MACHINES - I

L	T	P
3	1	0

UNIT I

Introduction

Links-types, Kinematics pairs-classification, Constraints-types, Degrees of freedom of planar mechanism, Grubler's equation, linkage mechanisms, inversions of four bar chain, slider crank chain and double slider crank chain **5**

Velocity in Mechanisms

Velocity of point in mechanism, relative velocity method, Velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, Rubbing velocity at a pin joint, Instantaneous center method, Types & location of instantaneous centers, Kennedy's theorem, Velocities in four bar mechanism & slider crank mechanism **3**

UNIT II

Acceleration in Mechanisms

Acceleration of a point on a link, Acceleration diagram, Coriolis component of acceleration, Crank and slotted lever mechanism, Klein's construction for Slider Crank mechanism and Four Bar mechanism, Analytical method for slider crank mechanism **4**

Mechanisms with Lower Pairs

Pantograph, Exact straight line motion mechanisms-Peaucellier's, Hart and Scott Russell mechanisms, Approximate straight line motion mechanisms–Grass-Hopper, Watt and Tchebicheff mechanisms, Analysis of Hooke's joint, Davis and Ackermann steering gear mechanisms. **5**

UNIT III

FRICTION

Laws of friction, Friction on inclined plane, Efficiency on inclined plane, Friction in journal bearing-friction circle, Pivots and collar friction-uniform pressure and uniform wear, Belt and pulley drive, Length of open and cross belt drive, Ratio of driving tensions for flat belt drive, centrifugal tension, condition for maximum power transmission, V belt drive **6**

Brakes & Dynamometers

Shoe brake, Band brake, Band and Block brake, Absorption and transmission type dynamometers **3**

UNIT IV

CAMS

Cams and Followers - Classification & terminology, Cam profile by graphical methods with knife edge and radial roller follower for uniform velocity, simple harmonic and parabolic motion of followers, Analytical methods of cam design – tangent cam with roller follower and circular cams with flat faced follower **7**

UNIT V

Gears & Gear Trains

Classification & terminology, law of gearing, tooth forms & comparisons, Systems of gear teeth, Length of path of contact, contact ratio, interference & under cutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, Sun and planet gear. **7**

Books and References:

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines-S.S. Rattan
6. Kinematics of Machines-Dr. Sadhu singh
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi & Gupta
9. Theory of Machines – R. K. Bansal
10. Theory of Machines – V. P. Singh
11. Theory of Machines – Malhotra & Gupta

EME-503 : MANUFACTURING SCIENCE-II

L	T	P
3	1	0

Unit-I

A Metal Cutting and Machine Tools

Metal Cutting-

Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Dynamometer. Brief introduction to machine tool vibration and surface finish. Economics of metal cutting. 9

Unit-II

Machine Tools

(i) Lathe : Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout. 2

(ii) Shaper, slotter, planer : Construction, operations & drives. 1

(iii) Milling : Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required. 2

(iv) Drilling and boring : Drilling, boring, reaming tools. Geometry of twist drills. 2

Unit-III

Grinding & Super finishing

(v) Grinding : Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and Cylindrical grinding. Centerless grinding. 4

(vi) Super finishing : Honing, lapping, polishing. 1

Standardization & Interchangeability, Limits, Fits & Tolerance and Surface-roughness:

Introduction to Standardization & Interchangeability Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness. 3

Unit-IV

B. Metal Joining (Welding)

Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding : Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing . 8

Thermodynamic and Metallurgical aspects in welding and weld,. Shrinkage/residual stress in welds. Distortions & Defects in welds and remedies. Weld decay in HAZ. 2

Unit-V

C. Introduction to Un-conventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding. 6

Books

1. Manufacturing science by Ghosh and Mallik
2. Fundamentals of Metal Cutting and Machine tools by Boothroyd
3. Production Technology by R.K. Jain
4. Production Technology - H.M.T.
5. Production Engineering Science by P.C. Pandey
6. Modern Machining Processes by P.C. Pandey & H.S. Shan
7. Manufacturing science by Degarmo
8. Fundamentals of metal cutting & machine tools - Juneja & Shekhon
9. Process & materials of manufacturing - Lindburg.
10. Advanced Machining Process - VK Jain

EME-504 HEAT & MASS TRANSFER

L:T:P
3:1:0

UNIT-1

Introduction to Heat Transfer:

Concepts of the mechanisms of heat flows; Conduction, convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism. 2

Conduction :

One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial and boundary conditions. 3

Steady State one-dimensional Heat conduction :

Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation. 3

UNIT-2

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells. 3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts. 4

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer. 4

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere ; Combined free and forced convection. 3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect. 8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers. 3

Condensation And Boiling :

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convective boiling. 3

Introduction To Mass Transfer :

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film. 2

Books:

1. Elements of Heat transfer by Bayazitouglu & Ozisik, McGraw-Hill Book Company.
2. Heat Transfer By J.P. Holman, McGraw-Hill International edition.
3. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill International edition.
4. Principles of Heat Transfer by Frank Kreith, McGraw-Hill Book co.
5. Fundamentals of Momentum, Heat and Mass Transfer by James R.Welty; John Wiley & Sons (Pvt). Ltd.
6. Heat Transfer, by Vijay Gupta, New Age International (P) Ltd. Publishers
7. Heat Transfer, by Y.V.C. Rao, University Press.
8. Heat Transfer, by R. Yadav, Central Publishing House, Allahabad.

EME-505 : I C ENGINES & COMPRESSORS **L T P**
2 1 0

Unit-1

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Comparison of Otto, Diesel and Dual cycles, Stirling cycle, Ericsson cycles, Actual cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, stratified charge engine. 5

Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines. 3

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines. 2

Unit–2

SI Engines:

Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines. 2

Carburetion, Mixture requirements, Carburetor types, Theory of carburetor, MPFI. 3

Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition. 2

Unit–3

CI Engine:

Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines. 2

Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings. 3

Scavenging in 2 Stroke engines, pollution and it's control. 2

Unit-4

Engine Cooling: Different cooling systems, Radiators and cooling fans. 1

Lubrication: Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation. 2

Supercharging: Effect of altitude on power output, Types of supercharging 1

Compressors:

Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency. 2

Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor. 2

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO
2. IC Engines, by Rogowsky, International Book Co.
3. A Course in International Combustion Engines, by Mathur & Sharma, Dhanpat Rai & Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata Mc Graw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata Mc Graw Hill Pub.

EME-551 : MACHINE DESIGN-I Lab

L	T	P
0	0	2

Note: Eight experiments out of the following are to be performed. Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

EME-553 : MANUFACTURING SCIENCE -II – LAB

L	T	P
0	0	3

Say, min 8 experiments out of the following
(or such experiment along-with study of the machines/processes)

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment
15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints, HAZ.

EME-554 : HEAT & MASS TRANSFER – LAB

L T P
0 1 2

Minimum 10 experiment of the following

1. Conduction - Composite wall experiment
2. Conduction - Composite cylinder experiment
3. Convection - Pool Boiling experiment
4. Convection - Experiment on heat transfer from tube-natural convection.
5. Convection - Heat Pipe experiment.
6. Convection - Heat transfer through fin-natural convection .
7. Convection - Heat transfer through tube/fin-forced convection.
8. Any experiment on Stefan's Law, on radiation determination of emissivity, etc.
9. Any experiment on solar collector, etc.
10. Heat exchanger - Parallel flow experiment
11. Heat exchanger - Counter flow experiment
12. Any other suitable experiment on critical insulation thickness.
13. Conduction - Determination of thermal conductivity of fluids.
14. Conduction - Thermal Contact Resistance Effect.

EPI-501 : PRODUCTION PLANNING & CONTROL

L T P
2 1 0

Unit-I

Introduction: Types and characteristics of production systems Objective and functions of Production, Planning & Control, Place of production, Planning in Engineering, manufactures organization. 3

Preplanning: Forecasting & Market Analysis. Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning. 4

Unit-II

Production Planning: Aggregate Planning, MPS, Material Resource Planning, Selection of material methods, machines & manpower. Routing, Scheduling and Dispatching and its sheets & charts, Production Line Balancing. 8

Unit-III

Production and Inventory Control: Progress control through records and charts. Types of inventories, Inventory Classification. Inventory Control under constraints Economic lot (batch) size. Trends in purchasing and store keeping, JIT production MRP II, comparison of Push & Pull systems, ERP, CAPPC. 8

Unit-IV

Productivity: Importance, Productivity patterns, productivity measurements & ratios, improvement-maintenance process. 3

Human Factors & Ergonomics: Human abilities, Training & motivation safety programs, workplace design & working conditions. 3

Books :

1. Elements of Production Planning & Control –Eilon
2. Production Planning & Control – Jain and Agarwal
3. Operations Management – Buffa.
4. Production System – J.L. Riggs.

EME-602 : MACHINE DESIGN-II

L	T	P
3	1	0

UNIT I

Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards. **5**

Helical Gears

Terminology, Proportions for helical gears, Beam strength and wear strength of helical gears, herringbone gears, crossed helical gears, Design of helical gears. **3**

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing **3**

UNIT II

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing, **5**

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing **6**

UNIT III

IC ENGINE PARTS

Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin; Design of connecting rod; Design of centre crankshaft **6**

Note: There will be three big questions from each unit. Units I & II each consists of 40 marks whereas Unit III consists of 20 marks. Design data book is allowed in the examination

Books and References:

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebers-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Machine design-M.F. Spott, Prentice Hall India
4. Machine Design-Maleev and Hartman, CBS
5. Machine design -Black & Adams, Mc Graw Hill
6. Machine Design-Sharma and Agrawal, S.K. Katara & Sons
7. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.

EME-603 : THEORY OF MACHINES-II

L	T	P
2	1	0

UNIT I

Static & Dynamic Force Analysis

Static equilibrium of two/three force members, Static equilibrium of member with two forces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalent offset inertia force, Dynamic force analysis of four link mechanism and slider crank mechanism, Engine force analysis-Piston and crank effort **5**

Turning Moment & Flywheel

Turning moment on crankshaft, Turning moment diagrams-single cylinder double acting steam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation of energy, Flywheel **3**

UNIT II

Balancing of Machines

Static and dynamic balancing, Balancing of several masses in the same plane and different planes, Balancing of reciprocating masses, Balancing of primary force in reciprocating engine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple, hammer blow **7**

UNIT III

Governors

Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter & Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, Stability, Hunting, Isochronism, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors **8**

UNIT IV

Gyroscopic Motion

Principles, Gyroscopic torque, Effect of gyroscopic couple on the stability of aero planes & automobiles **3**

Mechanical Vibrations

Types of vibrations, Degrees of freedom, Single degree free & damped vibrations, Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft **4**

Books and References:

1. Theory of Machines - Thomas Bevan
2. Theory of Machines and Mechanisms- Shigley
3. Theory of Machines and Mechanisms-Ghosh & Mallik
4. Theory of Machines and Mechanisms- Rao & Dukkipati
5. Theory of Machines - S.S. Rattan
6. Theory of Machines – R.K. Bansal
7. Mechanics of Machines – V. Ramamurti
8. Theory of Machines – Khurmi & Gupta
9. Theory of Machines – P.L. Ballaney
10. Theory of Machines – V. P. Singh

EME 604 : REFRIGERATION & AIR CONDITIONING **L T P**
3 1 0

Unit-1

Refrigeration:

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART). 8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system. 8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium-Bromide water vapour absorption system, Comparison. 5

Refrigerants:

Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. 3

Unit-4

Air Conditioning:

Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). 8

Unit-5

Refrigeration Equipment & Application:

Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning. 7

Books:

1. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
2. Refrigeration and Air conditioning by C.P Arora.
3. Refrigeration and Air conditioning by Arora & Domkundwar.
4. Refrigeration and Air conditioning by stoecker & Jones.
5. Refrigeration and Air conditioning by Roy J. Dossat.
6. Refrigeration and Air conditioning by P.L. Baloney.
7. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.

EME-651 : FLUID MACHINERY Lab

L T P
0 1 2

Minimum 8 experiments from following

1. Impact of Jet experiment.
2. Turbine experiment on Pelton wheel.
3. Turbine experiment on Francis turbine.
4. Turbine experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through detailed visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

EME-652 : MACHINE DESIGN-II Lab

L T P
0 1 2

A. Computer and Language : students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each student will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

EME-653 : THEORY OF MACHINES LAB

L T P
0 0 2

Note: Eight experiments out of the following are to be conducted

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

EME-654 : REFRIGERATION & AIR CONDITIONING Lab

L T P
0 0 2

Minimum 8 experiments out of following;

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. To study different types of expansion devices used in refrigeration system.
3. To study different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. To study air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

EPI-601 : PRINCIPLES OF MACHINE TOOL DESIGN

L T P
3 1 0

Unit-I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc. General requirement of machine tool design. Machine tool design process. Tool wear, force Analysis. 9

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, Selection of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools. 8

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control. 7

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design. 3

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports. 3

Layout of bearings, selection of bearings machine tools 2

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools. 5

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls. Basics of numerical controls. Machine tool testing. 3

Books :

1. Machine Tools Design & Numerical Controls –N.K. Mehta, T.M.H. New Delhi.
2. Design of Machine Tools – S.K. Basu Allied Publishers.
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central Book Agency.

EPI-651 : MACHINE TOOL DESIGN LAB

L	T	P
0	0	3

1. Measurement and analysis of cutting forces in orthogonal turning.
2. Flank wear – time characteristics for single point cutting tools.
3. (i) Checking the level of installation of a lathe in horizontal & vertical planes (ii) Checking the bed ways for straightness and parallelism.
4. Testing the main spindle of a lathe for axial movement and true running.
5. Process capability determination of a center lathe.
6. Flatness checking of a surface plate.
7. A study of devices for intermittent motion used in machine tools e.g. ratchet gear & Geneva Mechanism.
8. A study of Kinematics structure of lathe/milling machine.
9. A study of the drives for reciprocation used in machine tools.
10. Development the speed chart and gearing diagram for a gassed head lathe.
11. A study of the cone pulley drive in center lathe and development of its ray diagram for the speed structure.
12. Efficiency testing of lathe at various parameters-values.
13. Accuracy analysis of finished cylindrical work-pieces produced on a lathe.
14. Cutting (turning) with inclined placed tool (in tool fixture).
15. Turning with two simultaneously cutting tool (one from front on usual tool post and the other tool from back on tool-fixture on carriage)

EME-701 : COMPUTER AIDED DESIGN (CAD)

L	T	P
3	1	0

UNIT-I

Introduction:

Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications

Computer Graphics-I

CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

UNIT-II

Computer Graphics-II

Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm **4**

Geometric Transformations:

World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation **4**

UNIT-III

Curves:

Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

UNIT-IV

3D Graphics:

Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models

Application commands for AutoCAD & ProE software

UNIT-V

Numerical Methods:

Introduction, Errors in numbers, Binary representation of numbers, Root finding-Bisection method, Newton Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method

Finite Element Method:

Introduction, Principles of Finite elements modeling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element)

Books & References:

1. Computer Graphics	Hearn & Baker	Prentice Hall of India
2. Computer Aided Engineering Design	Anupam Saxena & B. Sahay	Anamaya Publishers
3. CAD/CAM	HP Groover & EW Zimmers, Jr.	Prentice Hall India Ltd.

4. CAD/CAM Theory and Practice	Ibrahim Zeid & R Sivasubramaniam	McGraw Hill
5. Computer Aided Design	RK Srivastava	Umesh Publications
6. Mathematical Elements for Computer Graphics	DF Rogers & JA Adams	McGraw Hill
7. Finite Element Method	SS Rao	
8. FE Analysis Theory and Programming	CS Krishnamoorthy	Tata McGraw Hill
9. Numerical Method for Engg Computation	MK Jain, SRK Iyenger & RK Jain	Wiley Eastern Limited
10. Computer Oriented Numerical Methods	V Rajaraman	Prentice Hall of India

EME -702

AUTOMOBILE ENGINEERING

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Unit-I

Power Unit and Gear Box:

Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination. Design of Gear box. 7

Unit-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer. 8

Unit-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects. 5

Chasis and Suspension System:

Loads on the frame. Strength and stiffness. Various suspension systems. 3

Unit-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc. 5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI. 4

Unit-V

Automobile Air Conditioning:

Requirements, Cooling & heating systems. 2

Cooling & Lubrication System:

Different type of cooling system and lubrication system. 2

Maintenance system:

Preventive maintenance, break down maintenance and over hauling. 2

References-

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
5. Automobile Engineering - Newton and Steeds.

EME-751 : CAD/CAM LAB

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Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

EME-752 : I.C. ENGINES AND AUTOMOBILE LAB

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Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.

6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.
8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

EME-801 : POWER PLANT ENGINEERING

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Unit-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations. 3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units. 2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection. 3

Unit-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant. 8

Unit-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant. 2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant 6

Unit-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants. 3

Hydro electric station

Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems. 4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc. 2

Unit-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc. 2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms. 3

Pollution

Pollution due to power generation 2

References

1. "Power Plant Engineering" F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. "Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi.
3. "Power Plant Technology" El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

EPI- 801 : QUALITY CONTROL

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UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability. 3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation. 5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables. 7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System. 3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure. **MTBF.** Maintainability, Condition monitoring and dignostic techniques. 4

Value Engineering : Elements of value analysis, Techniques. 2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts. 6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service. 2

Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

DETAILS OF DEPARTMENTAL ELECTIVES

ELECTIVE-1

EME-011 : FLUID MACHINERY

UNIT-I

Introduction:

Classification of Fluid Machines & Devices, Application of momentum and momentum equation to flow through hydraulic machinery, Euler's fundamental equation. 4

Impact of jet:

Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat *&* curve), Effect of inclination of jet with the surface.

Hydraulic Turbines:

Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel. 4

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines. 8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Model testing, Cavitation & separation and their control, Performance characteristics. 7

UNIT-IV

Positive Displacement Pumps:

Reciprocating pump theory, Slip and coefficient of discharges, Indicator diagram, Effect and acceleration, Work saved by fitting air vessels, Comparison of centrifugal and reciprocating pumps, Positive rotary pumps, Gear and Vane pumps, Performance characteristics. 6

UNIT-V

Other Machines:

Hydraulic accumulator, Special duty pumps, Intensifier, Hydraulic press, Lift and cranes, Theory of hydraulic coupling and torque converters, Performance characteristics. 5

Water Lifting Devices :

Hydraulic ram, Jet pumps, Air lift pumps.

BOOKS:

Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
Applied Hydraulics by Addison
Hydraulic Machines by R K Rajput, S.Chand & co Ltd.
Hydraulic Machines by D S Kumar

EME-012 : UNCONVENTIONAL MANUFACTURING PROCESSES

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Unit-I

Introduction: Limitations of conventional manufacturing processes, need of unconventional manufacturing processes & its classification and its future possibilities. 5

Unit-II

Unconventional Machining Process: Principle and working and applications of unconventional machining process such as Electro-Discharge machining, Electro-chemical machining, ultrasonic machining, Abrasive jet machining etc. 8

Unit-III

Unconventional Machining Process (continued) : Principle and working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining etc. (these can also be used for welding). 8

Unit-IV

Unconventional welding processes: Explosive welding, Cladding etc. Under water welding, Metalizing, Plasma are welding/cutting etc. 7

Unit-V

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-Discharge forming, water hammer forming, explosive compaction etc. 7

Electronic-device Manufacturing: Brief description of Diffusion and Photo- Lithography process for electronic-device manufacturing. 3

Books

1. Modern Machining Processes – P.C. Pandey
2. Unconventional Machining – V.K. Jain

EME -013 : **PRODUCT DEVELOPMENT AND DESIGN**

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Unit-I: Introduction to Product Design

Introduction to PDD, Applications, Relevance, Product Definition, Scope, Terminology. Design definitions, the role and nature of design, old and new design methods, Design by evolution. Examples such evolution of bicycle, safety razor etc. Need based development, technology based developments. Physical reliability & Economic feasibility of design concepts. 7

UNIT II: Morphology of Design

Divergent, transformation and convergent phases of product design. Identification of need, Analysis of need. Design for what? Design criteria, functional aspects. Aesthetics, ergonomics, form (structure). Shape, size, color. Mental blocks, Removal of blocks, Ideation Techniques. Creativity, Checklist. 7

UNIT III: Transformations

Brainstorming & Synectics. Morphological techniques. Utility concept, Utility value, Utility index. Decision making under multiple criteria. Economic aspects of design. Fixed and variable costs. Break-even analysis. 9

UNIT IV: Reliability

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel. Failure rate, MTTF and MTBF. Optimum spares from reliability consideration. Design of displays and controls, Man-Machine interface, Compatibility of displays and controls. Ergonomic aspects. Anthropometric data and its importance in design. Applications of Computers in product design. **7**

UNIT IV: Product Appraisal

Information and literature search, patents, standards and codes. Environment and safety considerations. Existing techniques such as work-study, SQC etc. which could be used to improve method & quality of product. Innovation versus Invention. Technological Forecasting. **8**

Recommended Books:

1. Product Design & Manufacturing - A.K.Chitab & R.C.Gupta, PHI (EEE).
2. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall

3. The Art of Thought – Grohem Walls – Bruce & Co., New York
4. Product Design & Decision Theory - M.K. Starr - Prentice Hall
5. Engg . Product Design -C .D. Cain, Bussiness Books.
6. Industrial design for Engineers –W .H. Mayall, Itiffe.
   Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
7. Human Factor Engg. – Mccormick E.J., Mc GrawHill.
8. Engineering: An Introduction to Creative profession – G.C. Beakley Hw leach, Macmillan.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H . Flurscheim, The Design Council - London.
10. Quality Control & Reliability Analysis – Bijendra Singh, Khanna Publications.

EME-014 : RELIABILITY ENGINEERING

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1. Introduction:
Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

2. Reliability Mathematics:
Definition of probability, laws of probability, conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis Procedures, empirical reliability calculations.

3. Reliability:
Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tieset methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

4. Reliability Improvements:
Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance.

5. Reliability Testing:
Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books Recommended :

1. R.Billintan & R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha & B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.

EME-021 : NON-CONVENTIONAL ENERGY RESOURCES AND UTILISATION

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UNIT-1

Energy resources and their utilization :
Indian and global energy sources, Energy exploited, Energy planning, Energy parameters (energy intensity, energy-GDP elasticity), Introduction to various sources of energy, Solar thermal, Photovoltaic, Water power, Wind energy, Biomass, Ocean thermal, Tidal and wave energy, Geothermal energy, Hydrogen energy systems, Fuel cells, Decentralized and dispersed generation. 3

Solar radiations:
Extra terrestrial radiation, Spectral distribution, Solar constant, Solar radiations on earth, Measurement of solar radiations, Solar radiation geometry, Flux on a plane surface, Latitude, Declination angle, Surface azimuth angle, Hour angle, Zenith angle, Solar altitude angle expression for angle between incident beam and the normal to a plane surface (no derivation), Local apparent time, Apparent motion of sun, Day length, Solar radiation data for India. 4

UNIT-2

Solar energy:
Solar thermal power and it's conversion, Solar collectors, Flat plate, Performance analysis of flat plate collector, Solar concentrating collectors, Types of concentrating collectors, Thermodynamic limits to concentration, Cylindrical collectors, Thermal analysis of solar collectors, Tracking CPC and solar swing . 2
Solar thermal energy storage, Different systems, Solar pond. 2
Applications, Water heating, Space heating & cooling, Solar distillation, solar pumping, solar cooking, Greenhouses, Solar power plants. 2

Solar photovoltaic system:
Photovoltaic effect, Efficiency of solar cells, Semiconductor materials for solar cells, Solar photovoltaic system, Standards of solar photovoltaic system, Applications of PV system, PV hybrid system. 2

UNIT-3

Biogas:
Photosynthesis, Bio gas production Aerobic and anaerobic bio-conversion process, Raw materials, Properties of bio gas, Producer gas, Transportation of bio gas, bio gas plant technology & status, Community biogas plants, Problems involved in bio gas production, Bio gas applications, Biomass conversion techniques, Biomass gasification, Energy recovery from urban waste, Power generation from liquid waste, Biomass cogeneration, Energy plantation, Fuel properties, Biomass resource development in India. 5

Wind energy:
Properties of wind, Availability of wind energy in India, wind velocity, Wind machine fundamentals, Types of wind machines and their characteristics, Horizontal and Vertical axis wind mills, Elementary design principles, Coefficient of performance of a wind mill rotor, Aerodynamic considerations in wind mill design, Selection of a wind mill, Wind energy farms, Economic issues, Recent development. 3

UNIT-4

Electrochemical effects and fuel cells:
Principle of operation of an acidic fuel cell, Reusable cells, Ideal fuel cells, Other types of fuel cells, Comparison between acidic and alkaline hydrogen-oxygen fuel cells,

Efficiency and EMF of fuel cells, Operating characteristics of fuel cells, Advantages of fuel cell power plants, Future potential of fuel cells . 3

Tidal power:

Tides and waves as sources of energy, Fundamentals of tidal power, Use of tidal energy Limitations of tidal energy conversion systems. 2

Hydrogen Energy:

Properties of hydrogen in respect of it's use as source of renewable energy, Sources of hydrogen, Production of hydrogen, Storage and transportation, Problems with hydrogen as fuel, Development of hydrogen cartridge, Economics of hydrogen fuel and its use.. 3

UNIT-5

Thermoelectric systems:

Kelvin relations, power generation, Properties of thermoelectric materials, Fusion Plasma generators.

Geothermal energy:

Structure of earth's interior, Geothermal sites, earthquakes & volcanoes, Geothermal resources, Hot springs, Steam ejection, Principal of working, Types of geothermal station with schematic representation, Site selection for geothermal power plants. Advanced concepts, Problems associated with geothermal conversion. 2

Ocean energy;

Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, Economics . 2

Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity production from different energy sources, Energy options for Indian economy. 2

Books / Reference:

Bansal Keemann, Meliss," Renewable energy sources and conversion technology", Tata Mc Graw Hill.

Kothari D.P., "Renewable energy resources and emerging technologies", Prentice Hall of India Pvt. Ltd.

Rai G.D, "Non-Conventional energy Sources", Khanna Publishers.

Ashok V. Desai, "Nonconventional Energy", New Age International Publishers Ltd.

EME-022 : ADVANCED WELDING TECHNOLOGY

Unit-I

Introduction : Importance and application of welding, classification of welding process. Selection of welding process. 2

Brief review of conventional welding process : Gas welding, Arc welding, MIG, TIG welding. Resistance welding. Electroslag welding, Friction welding etc. Welding of MS.CI, Al, Stainless steel & Maurer/Schaefflar Diagram. Soldering & Brazing. 5

Unit-II

Advanced welding Techniques- Principle and working and application of advanced welding techniques such as Plasma Arc welding, Laser beam welding, Electron beam welding, Ultrasonic welding etc. 7

Unit-III

Advanced welding Techniques (continued) : Principle and working and application of advanced welding techniques such as explosive welding/ cladding, Underwater welding, Spray-welding / Metallising, Hard facing. 7

Unit-IV

Weld Design : Welding machines/equipments and its characteristics and arc-stability, Weld defects and distortion and its remedies, Inspection/testing of welds, Weld Design, Welding of pipe-lines and pressure vessels. Life predication. 4

Thermal and Metallurgical consideration.: Thermal considerations for welding, temperature distribution, Analytical/Empirical analysis/formulae, heating & cooling curves. Metallurgical consideration of weld, HAZ and Parent metal, micro & macro structure. Solidification of weld and properties. 4

Books
Welding Hand Book

EME-023 : OPTIMISATION TECHNIQUES IN ENGINEERING

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Unit-I
Unconstrained Optimization: Optimizing Single-Variable Functions, conditions for Local Minimum and Maximum, Optimizing Multi-Variable Functions. **4**

Unit-II
Constrained Optimization: Optimizing Multivariable Functions with Equality Constraint: Direct Search Method, Lagrange Multipliers Method, Constrained Multivariable Optimization with inequality constrained: Kuhn-Tucker Necessary conditions, Kuhn – Tucker Sufficient Conditions. **8**

Unit-III
Optimization: Quasi-Newton Methods and line search, least squares optimization, Gauss-Newton, Levenberg- Marquartd, Extensions of LP to Mixed Integer Linear Programming (MILP), Non-Liner Programming, The Newton Algorithm, Non-Linear Least Squares, Sequential Quadratics Programming (SQP), Constrained Optimization, SQP Implementation, Multi-Objective Optimization, Branch and Bound Approaches, Genetic Algorithms and Genetic Programming, Singular Based Optimization, On-Line Real-Time Optimization, Optimization in Econometrics Approaches – Blue. **10**

Unit-IV
Optimization and Functions of a Complex Variable and Numerical Analysis: The Finite Difference Method for Poisson’s Equation in two Dimensions and for the Transient Heat Equation, Eulers Method, The Modified Euler Method and the Runga-Kutta Method for Ordinary Differential Equations, Gaussian Quardative Tranzoidal Rule and Simpson’s 1/3 and 3/8 Rules, the Newton Raphson in one and two Dimensions, Jacobi’s Iteration Method. **10**

Unit-V
Optimization in Operation Research: Dynamic Programming, Transportation – Linear Optimization Simplex and Hitchcock Algorithms, Algorithms, Minimax and Maximum Algorithm, Discrete Simulation, Integer Programming – Cutting Plane Methods, Separable Programming, Stochastic Programming, Goal Programming, Integer Linear Programming, Pure and Mixed Strategy in theory of Games, Transshipment Problems, Heuristic Methods. **8**

Books.
1. Winston W L: Operations Research: Applications and Algorithms
2. Rao S.S., Optimization: Theory and Applications.
3. Walsh G R: M methods of Optimization.
4. Williams H.P.: Model Building in Mathematics Programming.
5. Williams H.P.: Model Solving in Mathematics Programming
6. G.L. Nemhauser and L.A. Wolsey: Intger and Combinational Optimization.
7. R.G. Parker and R.L. Rardin:Discrete Optimization.

EME-024 : MECHANICAL VIBRATION

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UNIT - I

Introduction

Periodic motion, harmonic motion, superposition of simple harmonic motions, beats, Fourier analysis **3**

Single Degree Freedom System

Free vibration, Natural frequency, Equivalent systems, Energy method for determining natural frequency, response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement **5**

UNIT - II

Single Degree Freedom: Forced Vibration

Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments **8**

UNIT- III

Two Degree Freedom systems

Introduction, Principal modes, Double pendulum, Torsional system with damping, coupled system, undamped dynamic vibration absorbers, Centrifugal pendulum absorbers, Dry friction damper **8**

UNIT- IV

Multi Degree Freedom system: Exact Analysis

Undamped free and forced vibrations of multi-degree freedom systems, influence number, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts **8**

UNIT- V

Multi Degree Freedom system: Numerical Analysis

Rayleigh's, Dunkerely's, Holzer's ad Stodola methods, Rayleigh-Ritz method **5**

CRITICAL SPEED OF SHAFTS

Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed. **3**

Books and References:

1. Mechanical Vibrations – P. Srinivasan, TMH
2. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
3. Mechanical Vibrations – W. T. Thomson
4. Mechanical Vibrations – JS Rao & K Gupta, New Age
5. Mechanical Vibrations – Tse, Morse & Hinkle
6. Mechanical Vibrations – V. Rama Murthy, Narosa Publications

Department Elective-III

EME-031 : COMPUTER AIDED MANUFACTURING (CAM)

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UNIT-I

Automation

Introduction to CAM; Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends. **4**

Features of NC Machines-

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity. **3**

UNIT-II

NC Part Programming-

(a) Manual (word address format) programming. Examples Drilling, Turning and Milling; Canned cycles, Subroutine, and Macro. **5**

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement. **4**

UNIT-III

System Devices

Introduction to DC motors, stepping motors, feed back devices such as encoder, counting devices, digital to analog converter and vice versa. **3**

Interpolators

Digital differential Integrator-Principle of operation, exponential decelarion; DDA Hardware Interpolator- Linear, Circular; DDA Software Interpolator. **4**

Control of NC Systems

Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control. **3**

UNIT-IV

Computer Integrated Manufacturing system

Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection. **6**

UNIT-V

Robotics

Types and generations of Robots, Structure and operation of Robot, Robot applications. Economics, Robot programming methods. VAL and AML with examples. **6**

Intelligent Manufacturing

Introduction to Artificial Intelligence for Intelligent manufacturing. **2**

Books/References-

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. Computer control of Manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren
6. CAD/CAM by Groover.

EME-032 : Project Management L T P 3 1 0

I- Project Management Concepts:
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction. 8

II- Project Organization & Project Contracts:
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors. 8

III- Project Appraisal & Cost Estimation:
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis. 8

IV- Project Planning & Scheduling:
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique. 8

V- Modification & Extensions of Network Models:
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution.
Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections. 8

Books:

1. Project Management by K. Nagarajan
2. Project Management by Harvey Maylor

EME-033 : ADVANCED FLUID MECHANICS

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UNIT-I
Review of kinematics of fluid motion, method of describing fluid motion, translation, rate of deformation, the material derivatives, acceleration, vorticity in cartesian & polar coordinates, Reynolds transport theorem, Stress at a point, velocity profile, wall shear stress. 7

UNIT-II
Non-viscous incompressible flow- Equation of continuity, Euler's equation of motion, Bernoulli's equation, circulation and its theorem, stress function, velocity potential, irrotational flow, two dimensional source, sink, source-sink pair, doublet vortex, superposition of source-sink with rectilinear flow, Rankine body, Superposition of rectilinear flow and doublet, flow around a spinning circular cylinder, Magnus effect, lift & Drag, Skin friction. Lift of aerofoils. 9

UNIT-III

Boundary layer Concept-Introduction to boundary layer formation, Novier-stokes equation, Boundary layer thickness, momentum thickness, energy thickness, Boundary layer equations, Momentum-Integral equation - Von Korman, Blasius solution of boundary layer on a flat plate without pressure gradient, Flow with very small Reynolds number, Hogen poisseuille flow, Plane Couette flow, Hydrodynamic theory of lubrication. 8

UNIT-IV

Compressible flow- Propagation of pressure change, sound velocity, elastic waves, Mach number, Mach cone, isentropic flow relations in terms of sonic velocity and mach number, Stagnation properties, Regions of flow, Energy equation, Effect of Mach number on compressibility. Propagation of infinitesimal waves, Non-steep finite pressure wave and steep finite pressure waves, Expansion waves Isentropic flow with variable area, Mach number variation and its effect on Flow through nozzles and diffusers. Area ratio, impulse function, Use of Gas/Air tables. 8

UNIT-V

Flow with normal shock waves- Development of shock wave, rarefaction wave, governing equations, Prandtle-Meyer relation. Thermodynamic properties across shock. Wind tunnels. 3

Flow in constant area duct with friction-Fanno curves, Fanno flow equations, Solution of fanno flow equations. Variation of flow properties. Tables & charts for Fanno flow. 3

Flow in constant area duct with heat transfer- Rayleigh line, Fundamental equations, Rayleigh flow relation, Variation of flow properties. Tables & Charts for Rayleigh flow. 2

Books/ References:

1. Fluid Mechanics by White.
2. Fluid Mechanics by Streeter
3. Fluid Mechanics by Som & Biswas
4. Fluid Mechanics by K.L. Kumar
5. Fluid Mechanics by A.K. Jain
6. Fluid Mechanics by Robert W. Fox & Alan T. Mc Donald, Wiley Students Edition
7. Fundamentals of Compressible flow by S.M. Yahya
8. Gas Dynamics by Z. Hussain
9. Viscous fluid flow by White
10. Computational Fluid Dynamics by Anderson
11. Gas Dynamics by E. Radhakrishnan
12. Fluid Mechanics by Kundu & Cohen, Academic Press, Elsevier

EME-034 : EXPERIMENTAL STRESS ANALYSIS

L:T:P
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UNIT I

Elementary Elasticity:

Stress: Introduction, Stress Equations of Equilibrium, Laws of Stress Transformations, principal Stresses, Two-Dimensional State of Stress, Stresses Relative to Principal Co-ordinate System, Special States of Stress. **4**

Strain: Introduction, Displacement and Strain, Strain Transformation Equation, Principal Strains, Compatibility, Volume Dilation, Stress Strain Relations, Strain Transformation Equations and Stress Strain Relations for Two-Dimensional State of Stress. **4**

UNIT II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis. **4**

Brittle Coating Method: Coating Stresses, Failure Theories, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data. **4**

UNIT III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor. **4**

Strain Gage Circuit: Potentiometer and its Application, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges. **3**

Analysis of Strain Gage Data: Three Element Rectangular Rosette, Delta Rosette, Stress Gage, Plane Shear-Gage. **3**

UNIT IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Effect of Principal Directions, Effect of Principal Stress Difference, Stressed Model in Circular Polariscope, Light and Dark Field arrangements, Tardy Compensation, Fringe Sharpening and Multiplication by Partial Mirrors. **8**

UNIT V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method, Materials for Two-Dimensional Photoelasticity. **7**

Text Books:

1. Experiment Stress Analysis by James W. Dally and William F. Riley, International Student Edition, McGraw-Hill Book Company.
2. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.

^ Applicable only to those institutes which have the facility for Stress Analysis Lab

EME-036 : ADVANCED DYNAMICS OF MACHINERY

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UNIT I

Dynamic Analysis of Mechanisms and Machines: Introduction, Motion of Rigid Body under a System of Forces, Principle of Virtual Work, D'Alembert's Principle and Dynamic Equilibrium, Dynamic Force Analysis, Stresses in Moving Members, Motion Analysis, Equivalent Force and Mass Method. **8**

UNIT II

Dynamics of Direct Acting Engine Mechanisms: Introduction, Piston Motion, Turning Moment on Crank-Shaft, Dynamically Equivalent Link, Approximate Expression for Turning Moment, Correction to the Approximate Expression, Turning Moment Diagram, Fluctuation of Crank-Shaft Speed, Flywheel Analysis. **8**

UNIT III

Balancing of Inertia Force and Moments in Machines: Introduction, Balancing of Rotating Masses, Two-Plane Balancing, Determination of Balancing Masses, Balancing of Internal Combustion Engines. **7**

UNIT IV

Gyroscopic action in Machines: Introduction, Motion of a Rigid Body in Three-Dimensions, Principal Axes, Angular Velocity and Momentum about Principal Axes, Euler's Equation of Motion, Euler's Modified Equation, Simple Precession of a

Symmetrical Gyroscope in Angular Precession, Gyroscopic Effects in Machines, Gyroscopic Stabilization.

UNIT V

Dynamics of Rotating Shafts: Introduction, Critical Speed, Shaft with an Unbalanced Disc at Mid-Span, Generalized Forces, Lagrange's Equation of Motion, Gyroscopic Effect on Critical Speed.

Text Book:

1. Theory of Mechanisms and Machines by Amitabh Ghosh and Ashok Kumar Malik, Affiliated East- West Press Pvt. Ltd, New Delhi.
2. Theory of Machines and Mechanisms by Joseph Edward Shigley and John Joseph Uicker, J.R. International Student Edition, Mc-Graw Hill International Company.

EME-036 : MANAGEMENT INFORMATION SYSTEM

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Unit-I

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS. 6

Unit-II

Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS- dataflow diagram, flow chart etc. 10

Unit-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage. 8

Unit-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change.

Reports: Various types of MIS reports, GUI & Other Presentation tools. 6

Unit-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies. 10

Books

1. O.Brian, "Introduction to Information System", Mc-Graw Hill.
2. O.Brian, "Management Information System", TMH.
3. Alter, "Information Systems : A Management Perspective", Addison Wesley.
4. Arora & Bhatia, "Information Systems for Managers", Excel
5. Bansal, "Information System Analysis & Design", TMH.
6. Jawadegar, "Management Information System", TMH.
7. Murdick, "Information System for Modern Management", PHI.
8. Alexis Leon, "Enterprise Resource Planning", TMH.

Departmental Elective IV

EME-041 :TOTAL QUALITY MANAGEMENT (TQM)

Unit-I
Quality Concepts
Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.
Manufacturing Quality
Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II
Quality Management
Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.
Human Factor in Quality
Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III
Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.
Attributes of Control Charts
Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV
Defects Diagnosis and Prevention
Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V
IS0-9000 and its concept of Quality Management:
ISO 9000 series, Taguchi method, JIT in some details
References:
1. Lt. Gen. H.Lal, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. “Beyond Total Quality Management”. McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

EME-042: THERMAL TURBOMACHINES

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UNIT-I
Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam & gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbo machinery, Energy transfer in turbo machines, Euler’s equation, Definition of various efficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology, Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps. 8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoity diagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient, Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guide vanes, Centrifugal Compressor characteristic curves. 4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocity diagram for axial compressor, Factors affecting stage pressure ratio, Blockage in compressor annulus, Degree of reaction, 3-D flow, Design process, blade design, calculation of stage performance, Axial compressor performance characteristic curves. 4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocity diagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord, Estimation of stage performance, Characteristic curves. 4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine. 4

Pumps : Classification of Pumps, Main components, indicator diagram and modification due to piston acceleration, Performance characteristics, Cavitation and its control, Miscellaneous types of pumps. 4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropy diagram, State losses, Estimation of stage performance, Performance characteristics. 4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustion system types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparative evaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Design with traditional materials. 8

Books-

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Design of high efficiency turbomachinery and gas turbines, David Gordon Wilson, Theodosios Korakianitis, Prentice Hall International.
3. Turbomachinery : S.M. Yahya.
4. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.
5. Gas Turbine- Ganeshan, Tata Mc Graw Hill.

EME-043 : MECHANICAL SYSTEM DESIGN

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UNIT-I

Engineering process and System Approach

Basic concepts of systems, Attributes characterizing a system, system types, Application of system concepts in Engineering, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing **4**

Problem Formulation

Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system **4**

UNIT-II

System Theories

System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system. **4**

System modeling

Need of modeling, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system **4**

UNIT-III

Graph Modeling and Analysis

Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system **4**

Optimization Concepts

Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system. **3**

UNIT-IV

System Evaluation

Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system **4**

Calculus Method for Optimization

Model with one decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system. **4**

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant **5**

Books/References-

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Design Engineering-JR Dixon, TMH, New Delhi
3. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
4. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
5. Optimization Techniques-SS Rao
6. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

Department Elective-IV

EME-044: **<u>TRIBOLOGY</u>**

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Unit-I: Introduction to Tribology

Definition, Scope, Applications, Friction, Definition, Scope, Laws of friction. Friction theories. Surface contaminants, Effect of sliding speed on friction.

5

Unit-I: Wear
Definition, Scope, wear of metals, Types, Classification. Mechanism of wear, Quantitative laws. Hypothesis of Holm. Hypothesis of Burwell and Strang. Hypothesis of Archard, Rawe, Rabinowicz. Quantitative law for Abrasive wear, Bayerku surface fatigue theory. Delamination theory & Fatigue theory of wear, wear resistant materials. Introduction to wear of Polymers and Ceramics. Wear reduction by Surface Improvements, Pitting, Erosion & Stress Corrosion.

10

Unit-III: Surface Interactions
Elastic & Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies. Formulae for calculation of contact area. Physico-Mechanical properties of surface layers, Characteristics of Surface Geometry. Classes of surface roughness. Contact of rough surfaces. Interaction of surface peaks. Real and contour area of contact.

10

Unit-IV: Lubrication
Definition & Scope. Generalized Reynold's equation. Flow and shear stress, energy equation. Mechanism of pressure development in bearings. Concept of Boundry Layer.

5

Unit-IV: Bearing design considerations & characteristics
Bearing design procedure & steps. Plain slider bearing. Step (Rayleigh step) bearing. Infinitely long journal bearing. Infinitely short journal bearing. Future scope and applications.

8

REFERENCE BOOKS:

1. Introduction to Tribology of bearings by - B. C. Majumdar., S Chand & Co.
2. Hand Book of Tribology -- WHILEY
3. Fundamentals of Fluid film lubrication by – Bernard Hamrock, Mc Graw Hill International Edition.
4. Tribology in Industries by Sushil. K. Srivastava, S Chand & Publications.
5. Basic Lubrication theory by Alastair Cameron.

EME-045

INDUSTRIAL ERGONOMICS

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Unit-I

1. **Introduction:** Importance applications and principles of occupational ergonomics. 2
2. **Physiological Principles:** Muscular work, Nervous control of movements, Improving working efficiency. Optimal use of muscle strength. /Guidelines for work layout. 4
3. **Skilled work:** Acquiring skill, control of skilled movements. Design of tools and equipments for skilled work. 3

Unit-II

4. **Heavy work:** Energy consumption, Efficiency, Heart rate as a measure of workload. 2

5. **Work-station Design:** Anthropometric data, Reach and clearance dimensions. Percentiles to be accommodated. 5

Unit-III

6. **Working Heights:** Comfortable working postures. Room to grasp or move things, and operate controls. Sedentary work. Its advantages, disadvantages and limitation. Sedentary workplace design. Design of VDT workstations, Design of Key board. 5

7.Handling Lads: The Human spine, back troubles associated with industrial work, Intervertebral disc, disc pressure, slip of disc, Bio-mechanical models of lower back. Recommendations for handling loads. 3

8.Man-Machine System: Display equipment, Controls, Relation between control and display instruments, Mental activity, Fatigue, Occupational stress, Job design in monotonous task. 3

Unit-IV

9.Human Visual System: Accommodation, Aperture of the pupil, Adaptation of reline, eye movements Visual capacity, Visual strain, Physiology of reading. 3

10.Ergonomic Principles of Lighting: Light sources, measurement, physiological requirements of artificial lighting, arrangement of light. Light for fine work and for VDT offices. 3

Unit-V

11.Noise and Violation: Sound perception, Noise load, damage to hearing, physiological and psychological effects of noise. Protection against noise, Vibrations and their effect on performance. 3

12.Working Environment: Thermo-regulation in human body, comfort indoors, Air quality and its dryness, Air pollution and ventilation. Heat in industry Recommendations for comfort indoors.
Daylight, colours and music for pleasant work environment. 4

Books

1. Fitting the task to the Man, E. Gandjean, Taylor and Francis.
2. A guide to Ergonomics of Manufacturing, Helander, M., East-West Press.
3. Human Factor in Engineering and Design, Sanders, M.S., and Mc Cormik, E.J., Mc Graw.Hill

DEPARTMENT ELECTIVE-IV
EME-046

CONCURRENT ENGINEERING

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Unit-I
Introduction:

Background and challenges faced by modern production environment, sequential engineering process, Concurrent engineering definition and requirement, meaning of concurrent objectives of CE, benefits of CE, Life cycle design of products, life cycle costs. 4

Support for CE

Classes of support for CE activity, CE organizational, structure CE, team composition and duties, Computer based Support, CE Implementation Process. 4

Unit-II
Design Product for Customer

Industrial Design, Quality Function Deployment, house of quality, Translation process of quality function deployment (QFD). 3

Modeling of Concurrent Engineering Design

Compatibility approach, Compatibility index, implementation of the Compatibility model, integrating the compatibility Concerns. 4

Unit-III

Design for Manufacture (DFM)

Introduction, role of DFM is CE, DFM methods, e.g. value engineering, DFM guidelines, design for assembly, creative design methods, product family themes, design axioms, Taguchi design methods, Computer based approach to DFM. Evaluation of manufacturability and assemblability. 9

Unit-IV

Quality by Design

Quality engineering & methodology for robust product design, parameter and Tolerance design, Quality loss function and signal to noise ratio for designing the quality, experimental approach. 9

Unit-V

Design for X-ability

Design for reliability, life cycle serviceability design, design for maintainability, design for economics, decomposition in concurrent design, concurrent design case studies. 7

Books

1. Concurrent Engineering Kusiak John Wiley
2. Concurrent Engineering Menon Chapman & hall

Departmental Elective – V

EME-051 : OPERATIONS RESEARCH

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Unit-I

Introduction: Basics of Operations Research **1**

Linear Programming- **7**

Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal & dual problem sensitivity analysis.

Unit-II

Transportation & Assignment problems. **4**

Deterministic Dynamic Programming- **4**

Multistage decision problems & solution, Principle of optimality.

Unit-III

Decision theory- **4**

Decision under various conditions.

Game Theory- **2**

Two Person Zero sum game, Solution with / without Saddle point, Dominance Rule, Different Methods like Algebraic, Graphical, Liner Programming

Sequencing- **2**

Basic assumption**,** n Jobs through two / three machines, 2 Jobs on m machines.

Unit-IV

Stochastic inventory models- **5**

Single & multi period models with continuous & discrete demands, Service level & reorder policy

Simulations- **3**

Use, advantages& limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

Unit-V

Queuing models- **3**

Characteristics of Queuing Model, M/M/1 & M/M/S system, cost consideration

Project Management: **6**

Basic concept, Rules for drawing the network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

Text Books

Operations Research by : Wangner
Operations Research by : Taha
Introduction to Management Science by: Hiller & Hiller
Operations Research by : Wayne L. Winston

EME-052 : MAINTENANCE ENGINEERING & MANAGEMENT

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Unit-I

Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy-element, unit, standby, maintainability, availability, reliability and maintainability trade off. **8**

Unit-II
Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency. **8**

Unit-III
Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure. **8**

Unit-IV
Break down maintenance planning, assignment model, waiting time models expected waiting time, minimum cost service rate, PERT. **8**

Unit-V
Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management. **8**

Books:

1. Management of systems – R.N. Nauhria & R. Prakash.
2. Operations Research – Wangner.

EME-053 : DESIGN OF THERMAL SYSTEMS

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3:1:0

Unit-I
Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations
Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.
Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant. 5

Design & Selection of Air conditioning Apparatus
Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers. 3

Unit-II
Analysis of Complete Vapour Compression System – Design and Balancing of System Components
Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different Refrigerants in performance predication of the cycle.
Analysis of the complete vapour-compression-system and determination of ‘Balance Points’ using Graphical and Analytical methods, system simulation.
Layout & selection of Refrigerant, water and Brine pipings for the designed system.
Selection of Refrigeration and Air conditioning Controls for the system. 8

Unit-III

Design of Turbomachines:

Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor. 8

Unit-IV

Design of Heat Exchanger :

Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger. 8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM. 8

References

1. Refrigeration & Air Conditioning - By C.P. Arora
2. Refrigeration & Air Conditioning - By Manohar Prasad
3. Principles of Refrigeration (S.I.Units) - By Roy J.Dossat
4. Air Conditioning Engineering - By W,P.Jones
5. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
6. Refrigeration & Air Conditioning Data Book – Manohar Prasad
7. Ashrae hand Book – Fundamentals
8. Refrigeration & Air Conditioning-Stoecker & Jones
9. Refrigeration & Air condioning – By P.L.Ballaney

EME-054 : ADVANCED SYNTHESIS OF MECHANISM

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UNIT-I

Introduction:

Mechanisms, Classifications, Relative & absolute motion, degree of freedom, 4-bar mechanisms-planar & spatial mechanisms, Inversion and equivalent linkage, Transmission deviation and pressure angles **4**

Kinematic analysis of Planer motion

Relative velocity and velocity difference, Instantaneous centre, Poles and centrodes, Relative acceleration, acceleration difference

UNIT-II

Kinematic Synthesis

Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials **4**

Four bar coupler point curves:

Four bar linkage, Equation of coupler curves, Double points and symmetry, Robert Chebyshev theorem, Approximate and exact straight line mechanisms **4**

UNIT-III

Geometrical Method of Synthesis:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crank mechanism, Synthesis with three accuracy points, Pole triangle, Four position synthesis, Examples **7**

UNIT-IV

Algebraic Methods of Synthesis-I:

Displacement equation of four bar linkage, Crank and follower synthesis with three accuracy points, Four bar function generator with three accuracy points, Crank and follower synthesis: angular velocities and accelerations **8**

UNIT-V

Algebraic Methods of Synthesis-II:

Synthesis of slider crank mechanism with three accuracy points, Synthesis of slider crank mechanism with four accuracy points, Five accuracy points synthesis of crank and follower mechanism, Analysis of mechanical errors in linkage, Mechanical error in four bar linkage **8**

Books & References:

1. Kinematic Synthesis of Linkages	RS Hartenberg and J Denavit	McGraw Hill, New York
2. Kinematic and Linkage Design	AS Hall Jr	Prentice Hall India Ltd.
3. Mechanism and Machine Theory	Amitabh Ghosh and AK Mallick	
4. Mechanism Design: Analysis & Synthesis	Erdman & Sandor	Prentice Hall of India

EME-055 : Six Sigma Methods & Application

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Unit 1

Quality Perception; Quality in Manufacturing, Quality in Service Sector; Differences between Conventional and Six Sigma concept of quality; Six Sigma success stories.
Statistical foundation and methods of quality improvement.
Descriptive statistics: Data Type, Mean, Median, Mode, Range, Variation, Standard Deviation, Skewness, Kurtosis.
Probability Distribution: Normal, Binomial, Poisson Distribution

Unit 2

Basics of Six Sigma: Concept of Six Sigma, Defects, DPMO, DPU, Attacks on X'S, Customer focus, Six Sigma for manufacturing, Six Sigma for service. Z score,
Understanding Six Sigma organization, Leadership council, Project sponsors and champions, Master Black Belt, Black Belt, Green Belts.

Unit 3

Methodology of Six Sigma, DMAIC, DFSS, Models of Implementation of Six Sigma, Selection of Six Sigma Projects.

Unit 4

Six Sigma Tools: Project Charter, Process mapping, Measurement system analysis, Hypothesis Testing, Quality Function deployment, Failure mode effect analysis, Design of Experiments.

Unit 5

Sustenance of Six Sigma, Communication plan, Company culture, Reinforcement and control, Introduction to softwares for Six Sigma, Understanding Minitab, Graphical analysis of Minitab plots.

References:

1. Six Sigma: SPC and TQM in manufacturing and service, Geoff Tennant, Gower Publishing Co.
2. Six Sigma for managers, Greg Brue, TMH
3. What is Six Sigma, Pete Pande, TMH
4. The Six Sigma Way, Peter S. Pande, TMH Team Field book
5. The Six Sigma way, Peter S. Pande, TMH

EME-056 : CONCEPTS OF MODERN PHYSICS

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3 1 0

Unit-I

Atomic & Quantum Physics: Wave-Particle Duality. Atomic-models. Quantum Physics-Planck, Bohr, de-Brogli, Schrödinger, Heisenberg, Born. Quantum and Wave Mechanics. X-ray, Laser etc. 8

Unit-II

Particle Physics & Dynamics: Molecule, Atom and Nucleus. Elementary Particles (& antiparticles) and
its characteristics & historical development. Conservation laws. Quarks and quark-model. Simple particle interaction /dynamics. Feynman Diagrams & rules. 8

Unit-III

Relativistic Mechanics : Special-Relativity. Relativity as a bridge of electricity and magnetism.
Minikowaskian space-time. Introduction to General-Relativity (almost without Tensors), concept of curved
space-time and gravity as curvature. Tests of Special & General Relativity. 9

Unit-IV

Astro-physics and Cosmo-Dynamics: Brief review of universe big-bang to black-hole including nucleo-synthesis, solar-system and galaxy. Hubble's law. Critical density, space- from closed, flat, open. Recent
studies on Dark-matter and Dark-energy and its possible candidates. 8

Unit-V

Unification of forces: Fundamental forces- gravitational, electrical, magnetic, strong-nuclear & weak nuclear. Maxwell (& Faraday) unification of electric & magnetic field as electromagnetic. Brief
introduction (with Feynman diagram) to GSW Electro-weak unification, and Standard-model. Brief
mention of GUT, and String/M-theory. 7

Books

1. Stephen Hawking- Brief History of Time
2. Besier- Concept of Modern Physics
3. Krane- Modern Physics
4. Kaku- Beyond Einstein
5. Griffith- Quantum Electrodynamics
6. Griffith- Elementy Particles
7. Hartle- Gravity
8. Bryan Greene- Elegant Universe

EME-061: FINITE ELEMENT METHOD

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UNIT-I

Introduction

Introduction to finite difference method and finite elements method, Advantages and limitations, Mathematical formulation of FEM, Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayliegh Ritz method, Weighted Residual methods, Point Collocation method, Galarkin method - Steps involved in FEM.

UNIT-II

Types of Elements Used

Interpolation Polynomials - Linear elements Shape function - Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.

UNIT-III

Finite Element Formulation of Field Problems

1-D and 2-D heat transfer, fluid flow (incompressible and non viscous fluid) in ducts, Simple electrical and magnetic field problems. Simple Numerical examples

UNIT-IV

Finite Element Formulation of Solid Mechanics Problems

1-D problem of shaft; Truss element analysis of pinned truss, Plane stress/strain problems, Axi-symmetric problems, thin plate problems; Vibration of shafts & beams.

UNIT-V

Numerical Methods in FEM

Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature - Solution of finite element equations – Gauss Elimination Method, Cholesky decomposition.

Books:

1.	The Finite Element Method	O.C. Zienkiewicz and R.L. Taylor	McGraw Hill
2.	An Introduction to Finite Element Method	J. N. Reddy	McGraw Hill
3.	Finite Element Procedure in Engineering Analysis	K.J. Bathe	McGraw Hill
4.	Finite Element Analysis	C.S. Krishnamoorthy	Tata McGraw Hill
5.	Concepts and Application of Finite Element Analysis	R.D. Cook, D.S. Malcus and M.E. Plesha	John Wiley
6.	Introduction to Finite Elements in Engineering	T.R Chandragupta and A.D. Belegundu	Prentice Hall India
7.	Finite Element and Approximation	O.C. Zenkiewicy & Morgan	-
8.	Numerical Methods	E Balagurusamy	Tata McGraw Hill

EME-062 : NON-DESTRUCTIVE TESTING

L T P
3 1 0

Unit-1: Introduction
Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test chalk test (oil whitening test). Attractive uses of above tests in detecting surface cracks, bond strength & surface defects. **6**

Unit-2: Common NDT methods
Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test **6**
Magnetic particle Inspection – Scope , principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results. DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications. **5**

Unit-3: Radiographic methods
X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of Radiographs, limitations of γ-ray radiography – principle, equipment. Attenuation of electro magnetic radiations, source of radioactive materials & technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor. Advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study ─ X-ray of human body. **9**

Unit-4: Ultrasonic testing methods
Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body. **8**

Unit-5: Eddy Current Inspection
Principle, Methods, Advantages, Scope and limitations. Types of Probes. Case Studies. **4**

Suggested References:

(1) ASM Handbook Vol. 11, 8th Edition – Non-destructive Testing & Evaluation
(2) Research Techniques in NDT Vol.3, R.S. Shah, Academic
(3) Industrial Quality Control, Webstar
(4) Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New York.

EME-063 : ADVANCED MATERIALS TECHNOLOGY

L T P
3 1 0

UNIT-I: Introduction to Ferrous Materials
Plain carbon steels, their properties and application: plain carbon steels, effects of alloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, low and high temperature resisting steels, high strength steels, selections, specifications, form and availability of steel. Cast irons-white, grey, modular malleable and alloy cast irons. Recognised patterns of distribution of graphite flakes in grey cast iron. **10**

UNIT-II: Heat Treatment of Steels
TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austempering and martempering of steel. Surface hardening of steel-Carbonising nitriding carbonitriding cyniding, flues and inducation hardenirng microscopic determination of case depth and depth of hardening. **5**

Unit-III: Nonferrous materials
Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys, aluminum, magnesium and titanium alloys, bearing materials. Heat treatment of nonferrous materials– soputionizing, Aging and precipitations hardening.
Composites
Polymer – polymer, metal-metal, ceramic –ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites.
Refractory materials and coatings for high temperature applications.
Smart Materials-introduction, types and applications. Thin film shape memory alloys. **10**

Unit-IV: Biomaterials
Classes and application of materials in medicine and dentistry. Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion. **8**
Unit-V: Nuclear Materials
Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors, Fissile and fertile materials. Control & Construction Materials for Nuclear reactors, Moderators, Heat Exchangers. Radiation proof materials. Brief discussion of safety and radioactive waste disposal. **7**
References:

1. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, A.S. Hoffman, F.J. Sckoen, and J.E.L Emons, Academic Press, second edition, 2004.
2. Biomaterials: An Introduction (second edition) Joon B.Park & Roderic S.Lakes, Plenum Press, 1992.
3. Handbook of Materials for Medical Devices, Edited by J. R. Davis, ASM international, 2003.
4. Introduction to Nuclear Engineering, by J.R Lamarsh.
5. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.
6. Van Vlash - Elements of Material Science & Engineering John Wiley & Sons.

EME-064 : PRODUCTION & OPERATIONS MANAGEMENT

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Unit –I (6 sessions)
Managing Operations
Operations Management – Function, Evolution, Definition, Systems view of P&OM; Operations Strategies for Competitive Advantage;

Unit –II (9 sessions)
Planning (Designing) the conversion System
Designing Products, Services and Processes; Operations Capacity; Locating Production and Service facilities; Layout Planning.

Unit-III (7 sessions)
Organizing the conversion System
Job design, Production and Operations standards, and work measurement; Project Management.

Unit-IV (8 sessions)
Scheduling Production and Service System
Scheduling systems, Aggregate Planning for Production and service system; Operations Scheduling.

Unit-V (10 sessions)
Material Requirements Planning
Planning for needs, applying MRP, Detailed capacity planning, MRP II.
Managing for World class Competition
World class Manufacturing practices; Managing for Quality; Conversion Process in change.

SUGGESTED READINGS

1) Adam Jr Everett E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)
2) Russell & Taylor III – Operations Management (Pearson, 4^{th} Edition)
3) Hill T- Operations Management (Palgrave, 2000)
4) McGregor D – Operations Management (McGraw-Hill, 1960)
5) Morton - Production and Operations Management (Vikas)
6) Gaither & Frazier - Operations Management(Cengage Learning, 9^{th} edition)

EME-065 : ENERGY MANAGEMENT

L T P
3 1 0

UNIT-1
Introduction to energy, Sources of energy, Forms of energy, Energy reserves, renewable energy sources, Unites of energy and the laws of thermodynamics,, Energy consumption and GDP, energy database , Energy demand analysis, Costs of exploration and utilization of depletable resources, energy pricing, National energy plan. 7

UNIT-2
Energy audit concepts, Energy audit based on 1^{st} law and 2^{nd} law of thermodynamics, Mass and Energy balances, Availability analysis, Evaluation of energy conserving opportunities, Economic analysis and life cycle costing. 7

UNIT-3
Energy conservation areas, Energy transmission and storage, Plant wide energy optimization Models, Data base for energy management , Energy conservation through controls, Computer aided energy management, Program organization and methodology. 7

UNIT-4
Electrical energy conservation in building lighting, heating, ventilating and air conditioning, Energy efficient motor, power factor improvement in power systems, Energy audit of Combustion process, Boilers, Turbines, compressors, Pumps, Heat exchangers, Condensers, Use of industrial, wastes. 9

UNIT-5
Energy environment interaction, Environmental issues, Global warning, Carbon dioxide emissions, Depletion of ozone layer, Government's regulations, Energy economy interaction. 7

BOOKS:

1. Energy Management and condevtion, by Clive Beggs, Butterwoth- Heinemann Elsevier Science.
2. Optimising Energy Efficiency in the Industry, By Rajan, Tata Mc Graw Hill Publishers.
3. Guide to energy Management , By C.L Capehart, Fairmont Press.

4. Renewable Energy Sources and their Environment Impact, by Abbasi & Abbasi, Prentice Hall of India.
5. Environmental Risks and Hazards by Cutter, Prentice Hall of India.
6. Energy and Power Risk Management: New Developments in Modeling, Pricing and Hedging, buy Alexander Eydeland, John Wiley & Sons.
7. Energy Management Handbook by, Wayne C. Turner.
8. Thermodynamics, By Kenneth Wark, Tata Mc Graw Hill Publishers.
9. Exergy Analysis of Thermal, Chemical and Metallurgical Process, By Jan Szargut, David R. Morris, Frank R. Steward, Hemisphere Pub, Springer Verlag Publisher

EME-066 : FUNDAMENTALS OF BIOMEDICAL ENGINEERING

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UNIT I : **Biomechanics**

Statics and dynamics of the musculoskeletal system, forces and moments. Acting in the skeletal system and the various techniques used to describe them. Forces and moments with in the body such as forces acting at hip and knee joint and in the extremities. Analysis of pathological situations of human joints.

9

UNIT II: Biomaterials

Stress strain behaviour of bone. The mechanical properties including elasticity, hardness, viscoelasticity, surface and fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications. The effects of degradation and corrosion. **8**

UNIT III : Bio Fluid Flow

Fluids-laminar and turbulent flow, boundary layer, non-newtonian and pulsatile models, blood rheology, circulatory system, blood-flow in arteries, veins and heart, synovial fluid, joint friction. **6**

UNIT IV : Bioinstrumentation

Fundamentals of producing a medical image, image collection techniques, image reconstruction algorithms, detailed examination of the four main areas of medical imaging : Nuclear Medicine and positron Emission Tomography, Ultrasound, Diagnostic Radiology, Magnetic Resonance and its clinical applications. Physiological signals, noise, and available sensors and transducers and their characteristics. **9**

UNIT V

Computing for Biomedical Engineers

Health care information and communications, Including telemedicine, medical informatics, networks and privacy. Data Collection, Medical coding and classification. Standards for medical data interchange. Aspects of database design, client/server topologies. **6**

Reference:

1. Basic orthopedic biomechanics, Editors-VC Mow & Wc Hayes, Lippincott Raven Publishers.
2. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, Allan S.Hoffman, Frederick J.Schoen, Jack E.Lemmons, Editors, Academic Press.
3. Biomaterials: An Introduction(second edition) Joon B.Park & Roderic S.Lakes, Plenum Press, 1992.
4. Biofluid Mechanics, Jagan N.Mezumdar; World Scientific Pub.Co.,NJ 1992
5. Handbook of Biomedical Instrumentation, RS Khandpur.
6. Mthematical models in biology and medicine- J.N.Kapur, Affliated East West Press Pvt. Ltd., NewDelhi-India
7. Bone Mechanism – W.C.Heys, CRC Press
8. Computers in Medicine- Lele.

Modified & Revised

G.B. TECHNICAL UNIVERSITY, LUCKNOW

Study and Evaluation Scheme

B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engg., B.Tech. Electronics & Tele Communication Engg.

[Effective from the session 2010-11]

YEAR 3rd, SEMESTER-V

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1	EEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	EEC 502	Principles of Communications	3	1	0	30	20	50	100	150	4
3	EEC 503	Microprocessors	3	1	0	15	10	25	50	75	3
4	EEC 504	Antenna &Wave Propagation	3	1	0	15	10	25	50	75	3
5	EIC 501	Control Systems - I	3	1	0	30	20	50	100	150	4
6	EHU 501	Engineering and Managerial Economics	3	1	0	30	20	50	100	150	3
7	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC 551	Integrated circuits Lab	0	0	2	--	20	20	30	50	1
9.	EIC 551	Control Systems Lab	0	0	2	--	20	20	30	50	1
10.	EEC 552	Communication Lab- I	0	0	2	--	20	20	30	50	1
11.	EEC 553	Microprocessors Lab	0	0	2	--	20	20	30	50	1
12.	GP 501	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**6**	**8**	**150**	**180**	**380**	**620**	**1000**	**26**

Modified

G.B. TECHNICAL UNIVERSITY, LUCKNOW
Study and Evaluation Scheme
B.Tech. Electronics Engineering, B.Tech. Electronics & Communication Engg., B.Tech. Electronics & Tele Communication Engg.
[Effective from the session 2010-11]

YEAR 3rd, SEMESTER-VI

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EHU 601	Industrial Management	3	0	0	30	20	50	100	150	3
2.	EEC 601	Digital communication	3	1	0	30	20	50	100	150	4
3.	EEC 602	Digital Signal Processing	3	1	0	30	20	50	100	150	4
4.	EEC 603	Microwave Engineering	3	1	0	30	20	50	100	150	4
5.	EEC 604	Introduction to Electric Drives	3	1	0	15	10	25	50	75	3
6.		Departmental Elective-I**	3	1	0	15	10	25	50	75	3
7.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
8.	EEC 654	Seminar	0	0	2	--	50	50	-	50	1
9.	EEC 651	Communication Lab – II	0	0	2	--	20	20	30	50	1
10.	EEC 653	CAD of Electronics Lab	0	0	2	--	20	20	30	50	1
11.	EEC 652	DSP Lab	0	0	2	--	20	20	30	50	1
12.	GP 601	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**18**	**5**	**8**	**150**	**210**	**410**	**590**	**1000**	**26**

LIST OF ELECTIVES:

Elective – I**

1. EEC 011 Analog signal processing
2. EEC 012 Data Structures
3. EEC 013 Advance Semiconductor Devices
4. EIC 601 Microcontroller

Syllabus fifth semester: THEORY SUBJECTS

(Revised) EEC 501 INTEGRATED CIRCUITS			3 1 0
Unit	Topic	Chapter/ Section From Text [1]	Proposed number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR	5.6, 6.4, 6.5 10.1-10.6	8
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors Filters: First and second order LP, HP, BP BS and All pass active filters, KHN, Tow-Thomas and State Variable Biquad filters; Sinusoidal oscillators	2.2-2.7 11.4, 11.7, 12.1, 12.2	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates Latches and Flip flops**:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	13.2-13.3 13.7	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multivibrator, Monostable multivibrator, Generation of Triangular Waveforms	12.1, 12.4, 12.5 12.9	8
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multivibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	10.9-10.11 12.7 6.5 of Ref [2]	8
Text Book: [1] Sedra and Smith, “Microelectronic Circuits”, 4th Edition, Oxford University Press.			
Reference Books: [2] Michael Jacob, `Applications and Design with Analog Integrated Circuits’, PHI, 2nd Edn, 2006 [3] Jacob Milliman and Arvin Grabel, “Microelectronics”, 2nd Edition, TMH, 2008.			

EEC 502 PRINCIPLES OF COMMUNICATIONS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction: Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals, Amplitude Modulation: Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	1.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	4.1-4.6	8
III	Pulse Modulation Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing ,Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy,.	5.1-5.5	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises ,Mathematical Representation of Noise,	5.6-5.7 7.1-7.5	7
V	Noise in Amplitude Modulation: Analysis ,Signal to Noise Ratio, Figure of Merit ,Noise in Frequency Modulation: Pre emphasis ,De Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital	8.1-8.3 9.1, 9.2,9.4, 9.6, 10.1-10.3	7

Text Book:

1. H. Taube, D L Schilling, Goutom Saha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.

Reference Books:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 3rd Edition, Oxford University Press, 2009.
1. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
2. H. P. HSU & D. Mitra , "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

EEC- 503 MICROPROCESSORS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction to Microprocessor, Microprocessor architecture and its operations, Memory, Input & output devices, Logic devices for interfacing, The 8085 MPU, Example of an 8085 based computer, Memory interfacing.	1.1, 3.1, 3.2, 3.3, 3.5, 4.1, 4.2, 4.3,	8
II	Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Flow chart symbols, Data Transfer operations, Arithmetic operations, Logic Operations, Branch operation, Writing assembly language programs, Programming techniques: looping, counting and indexing.	5.1, 5.2, 5.3, 5.4, 6.1, 6.2, 6.3, 6.4, 6.5, 7.1	8
III	Additional data transfer and 16 bit arithmetic instruction, Arithmetic operations related to memory, Logic operation: rotate, compare, counter and time delays, Illustrative program: Hexadecimal counter, zero-to-nine, (module ten) counter, generating pulse waveforms, debugging counter and time delay, Stack, Subroutine, Restart, Conditional call and return instructions, Advance subroutine concepts, The 8085 Interrupts, 8085 vector interrupts.	7.2, 7.3, 7.4, 7.5, 8.1, 8.2, 8.3, 8.4, 8.5, 9.1, 9.2, 9.3, 9.4, 12.1, 12.2	8
IV	Program: BCD-to-Binary conversion, Binary-to-BCD conversion, BCD-to-Seven segment code converter, Binary-to-ASCII and ASCII-to-Binary code conversion, BCD Addition, BCD Subtraction, Introduction to Advance instructions and Application, Multiplication, Subtraction with carry.	10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9	8
V	8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer, 8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller. Introduction to 8086 microprocessor: Architecture of 8086 (Pin diagram, Functional block diagram, Register organization).	15.1, 15.2, 15.4, 15.5, 15.6, 2.11*, 2.12*	8

Text Book:

1. Ramesh Gaonkar, "Microprocessor Architecture, Programming, and Applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. * Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, TMH, 2006.

Reference Book: Kenneth L. Short, "Microprocessors and programmed Logic", 2nd Ed, Pearson Education Inc.

EEC 504 ANTENNA AND WAVE PROPAGATION			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Antennas Basics** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle)ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance, Retarded Potential, Far Field due to an alternating current element, Power radiated by a current element, Field variation due to sinusoidal current distribution.	2.1 to 2.12, 2.18 to 2.20 4.3 to 4.7	8
II	**Point Sources and Their Arrays** Introduction, Point Source ,Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non-uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	5.1 to 5.5 5.9 to 5.11, 5.13, 5.15, 6.2 to 6.6, 6.10, 6.11, 6.14 to 6.15, 6.16 to 6.17, 6.21	10
III	The Loop Antenna. Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas	6.23,6.24,7.4, 7.5,7.13,7.19, 8	7
IV	**Reflector Antennas** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types(summarized), Feed Methods for Parabolic Reflectors, **Antenna Measurements** Introduction, Antenna Measurement ranges, Radiation pattern Measurements, Gain and Directivity Measurements, Spectrum Analyzer	9.2,9.3,9.5 to 9.9, 9.10, 10, 11.7, 14	8
V	**Ground Wave Propagation** Plane Earth Reflection, Space Wave and Surface Wave, **Space Wave Propagation** Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth, **Sky wave Propagation** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	23.2 to 23.3, 24.1 to 24.4, 25.1 to 25.6, 25.8, 25.12	10
Text Book: 1- John D Krauss, Ronald J Marhefka and Ahmad S. Khan,"Antennas and Wave Propagation", Fourth Edition, Tata McGraw Hill, 2010 Special Indian Edition.			

Reference Books:

1. A .R. Harish, M. Sachidananda, "Antennas and Wave Propagation", Oxford University Press, 2009.
2. Jordan Edwards C. and Balmain, Keith G."Electromagnetic Waves and Radiating Systems", PHI.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.

Unit	**EIC 501 CONTROL SYSTEM I**	Text Book/ Chapter	Proposed number of Lectures
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	1.1 to 1.3 3.1 to 3.2 4.1 to 4.6	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions.	5.1 to 5.6	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system	7.1 to 7.6	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability-continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion.	6.1 to 6.5	8
V	Frequency Domain Analysis: M_r *(resonant peak) and* ω_r *(resonant frequency)* and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with the Bode plot	9.1to 9.11	10

Text Book: B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", 8th Edition, John Wiley India, 2008.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press, 2010.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Control Systems" Schaums Outlines Series, 3rd Edition, Tata McGraw Hill, Special Indian Edition 2010.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers

LABOROTARY

EEC 551 INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostable multivibrator using IC 555.

EEC 552 COMMUNICATION LAB-I

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
    a. using switching method
    b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

EEC 553 MICROPROCESSOR LAB

1. Write a program using 8085 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085.
4. To find the largest and smallest number in an array of data using 8085 instruction set.
5. To write a program to arrange an array of data in ascending and descending order.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085 through RS-232 C port.

Note :-In addition, Institutes may include two more experiments based on the expertise.

EIC 551 CONTROL SYSTEM LAB

1. DC SPEED CONTROL SYSTEM
   (a) To study D.C. speed control system on open loop and close loop.
   (b) To study of Transient performance, another time signal is added at the input of control Circuit.
   (c) To study how eddy current breaking is being disturbance rejected by close and open loop.
2. DC MOTOR POSITION CONTROL
   (a) To study of potentiometer displacement constant on D.C. motor position control.
   (b) To study of D. C. position control through continuous command.
   (c) To study of D.C. position control through step command.
   (d) To study of D.C. position control through Dynamic response.
3. AC MOTOR POSITION CONTROL
   (a) To study of A.C. motor position control through continuous command.
   (b) To study of error detector on A.C. motor position control through step command.
   (c) To study of A.C. position control through dynamic response.
4. MAGNETIC AMPLIFIER
   (a) To study Input / Output characteristic of a magnetic amplifier in mode (i) Saturable Reactor, (ii) Self Saturable Reactor.
5. SYNCHRO TRANSMITTER / RECEIVER
   (a) To study of Synchro Transmitter in term of Position v/s Phase and voltage magnitude with respect to Rotor Voltage Magnitude/Phase.
   (b) To study of remote position indication system using Synchro-transmitter/receiver.
6. PID CONTROLLER
   (a) To observe open loop performance of building block and calibration of PID Controls.
   (b) To study P, PI and PID controller with type 0 system with delay.
   (c) To study P, PI and PID controller with type 1 system.
7. LEAD LAG COMPENSATOR
   (a) To study the open loop response on compensator.
   (b) Close loop transient response.
8. LINEAR SYSTEM SIMULATOR
   (a) Open loop response
   (i) Error detector with gain, (ii) Time constant, (iii) Integrator
   (b) Close loop system
   (I) First order system (II) Second order system (III) Third order system
9. Introduction to MATLAB (Control System Toolbox), Implement at least any two experiment in MATLAB.
   a. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
   b. Determine transpose, inverse values of given matrix.
   c. Plot the pole-zero configuration in s-plane for the given transfer function.
   d. Determine the transfer function for given closed loop system in block diagram representation.
   e. Plot unit step response of given transfer function and find peak overshoot, peak time.
   f. Plot unit step response and to find rise time and delay time.
   g. Plot locus of given transfer function, locate closed loop poles for different values of k.
   h. Plot root locus of given transfer function and to find out S, Wd, Wn at given root & to discuss stability.
   i. Plot bode plot of given transfer function.
   j. Plot bode plot of given transfer function and find gain and phase margins
   k. Plot Nyquist plot for given transfer function and to compare their relative stability
   l. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain and phase margin.

Syllabus sixth semester: THEORY SUBJECTS

EEC 601 DIGITAL COMMUNICATIONS			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques. (QPSK and MSK),M-ary Digital carrier Modulation.	7.1-7.10, 10.11	10
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes,	8.1-8.7, 9.1-9.4	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	10.1-10.7	8
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum(FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	11.1-11.7,12.7	6
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memory less channel Error Correcting codes: Hamming sphere, hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability , Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	13.1-13.5, 14.1-4.4, 14.6-14.11	8

Text Book:

1. B.P. Lathi, "Modern Digital and Analog communication Systems", 4th Edition, Oxford University Press, 2010.

Reference Books:

1. H. Taub, D L Schilling, Goutom Saha, "Principles of Communication", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd.
2. John G. Proakis, "Digital Communications", 4th Edition, McGraw-Hill International.
3. Simon Haykin, "Communication Systems",4th Edition, Wiley India.
4. H P HSU & D Mitra, "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill Publishing Company Ltd.

EEC 602 DIGITAL SIGNAL PROCESSING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H(z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	4.1, 4.5, 4.6, 4.7, 4.8	8
II	**Design of Infinite Impulse Response Digital Filters**: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All-Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters	5.2-5.6	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows ,The Kaiser Window	6.2-6.5	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution	7.1-7.4	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency(DIF) Algorithm	8.1-8.4	8
Text Books: Johnny R. Johnson, "Digital Signal Processing", PHI Learning Pvt Ltd., 2009.			
Reference Books: 1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education. 2. Oppenheim & Schafer, " Digital Signal Processing" PHI			

EEC 603 MICROWAVE ENGINEERING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Micro strip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	4.1-4-3,11.0-11.3	8
II	Scattering Matrix , Passive microwave devices: Microwave Hybrid Circuits. , Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. S parameter analysis of all components.	4.4-4.6	8
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	9.0-9.5, 10.0-10.2	8
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit –time devices: IMPATT Diode, TRAPPAT Diode,	5.0-5.1,5.3,6.0-6.1,7.0-7.3	10
V	Microwave Measurements: General set up of a microwave test bench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	14.1-14.4 (Book 2)	8

Text Books:

1. Samuel Y. Liao, “Microwave Devices and Circuits”, 3rd Ed, Pearson Education.
2. A. Das and S. K. Das, “Microwave Engineering”, TMH.

Reference Books:

1. R.E Collin, “Foundation for Microwave Engineering “, 2nd Ed., John Wiley India.

EEC 604 INTRODUCTION TO ELECTRIC DRIVES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Thyristor:** Principles and Characteristics Gate Triggering Circuits	1.1-1.16 2.1-2.10	8
II	**Phase Controlled Rectifiers** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	4.2 – 4.4 4.6 – 4.8 5.1 – 5.3, 5.5. 5.7-5.8	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper **Cycloconverters:** Introduction, The Basic Principle of Operation, Single-phase to Single-phase Cycloconverter, Three-phase half-wave Cycloconverters, Cycloconverter Circuits for Three-phase Output	6.2 – 6.5, 6.8 7.1 – 7.5	8
IV	**Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	12.1 – 12.10	8
V	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	13.1 – 13.9	8
Text Book: M.D. Singh & K. Khan chandani, “Power Electronics”, Tata McGraw Hill 1998 Edition			
Reference Books: M H Rashid, “Power Electronics”, 3rd Ed., Pearson Education, 2009.			

Departmental Electives I:

EEC- 011 ANALOG SIGNAL PROCESSING			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Liner Analog Functions: Addition , Subtraction, Differentiation, Integration, Impedance Transformation and Conversion	4.1-4.5 Text book 1	8
II	AC/DC Signal Conversion: Signal Rectification, Peak and Valley Detection, rms to dc Conversion, Amplitude Demodulation	5.2-5.5 Text book 1	8
III	Other Nonlinear Analog Functions: Voltage Comparison, Voltage Limiting(Clipping), Logarithmic Amplifiers, Analog Multipliers, Analog Dividers	6.1-6.6 Text book 1	8
IV	Continuous time op-amp RC filters: Second order LP, HP, BP, Notch and AP transfer functions, Kirwin-Huelsman-Newcomb biquad, Ackerberg-Mosberg Circuits, Tow-Thomas biquad, compensated integrators, Sallenkey Circuits, Generalized convertor, GIC biquads.	4.2, 4.3, 4.4, 4.5 Text book 2	8
V	Transconductance-C filters: Transconductance cells, realization of resistors, integrators, amplifiers, summers and gyrators, first order and second order sections, Ladder design.	16.1, 16.2, 16.3, 16.4.2 Text book 2	8

Text Books:

1. Ramon Pallas-Areny, John G. Webster, “Analog Signal Processing”, John Wiley& Sons
2. R. Schaumann and M. E. Valkenberg, “Design of Analog Circuits”, Oxford University Press, 2001.

EEC 012 DATA STRUCTURE			3 1 0
Unit	**Topic**	Chapter/ Section	Proposed number of Lectures
I	**Introduction:** Basic Terminology, Elementary Data Organization, Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big-Oh, time-Space trade-off, Abstract Data Types (ADT) **Arrays:** Definition, Single and Multidimensional Arrays, Representation of Arrays: Row major Order, and Column Major Order, Application of arrays, Sparse Matrices and their representations. **Linked lists:** Array Implementation and Dynamic Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List, Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.		8
II	**Stacks:** Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of Postfix expression, Recursion, Tower of Hanoi Problem, Simulating Recursion, Principles of recursion, Tail recursion, Removal of recursion**.** **Queues:** Operations of Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue		8
III	Trees: Basic terminology, Binary Trees, Binary Tree Representation: Array Representation and Dynamic Representation, Complete Binary Tree, Algebraic Expressions, Extended Binary Trees, Array and Linked Representation of Binary trees, Tree Traversal algorithms: In-order, Pre-order and Post-order, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm.		8
IV	**Graphs:** Terminology, Sequential and linked Representations, of Graphs: Adjacency Matrices, Adjacency List, Adjacency Multi list, Graph Traversal: Depth First Search and Breadth first Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kurskal algorithm, Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijikstra Algorithm, Introduction to Activity Networks.		8
V	**Searching:** Sequential search, Binary search, Comparison and Analysis, Internal Sorting: Insertion Sort, selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Practical consideration for Internal Sorting. Search Trees: Binary Search Trees (BST), Insertion and Deletion in BST, Complexity of search Algorithm, AVL trees, Introduction to m-way Search Trees, B Trees & B+ Trees Storage Management: Garbage Collection and Compaction.		8

Text Book:

1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein “Data structures Using C and C++”, PHI
2. Lipschutz, “Data Structures” Schaum’s Outline Series, TMH

Reference Books:

1. Horowitz and Sahani, “Fundamentals of Data Structures”, Galgotia Publication

EEC 013 ADVANCE SEMICONDUCTOR DEVICES			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	**Review of Fundamentals of Semiconductors:** Semiconductor Materials and their properties Carrier Transport in Semiconductors Excess Carriers in Semiconductor	3.1 to 3.8 4.1 to 4.9 5.1 to 5.7	10
II	**Junctions and Interfaces:** Description of p-n junction, Action, The Abrupt Junction, Example of an Abrupt Junction, The linearly graded Junction. The Ideal Diode Model, Real Diodes, Temperature Dependence of I-V Characteristics, High Level Injection Effects, Example of Diodes. Description of Breakdown Mechanism, Zener and Avalanche Breakdown in p-n Junction	6.1 to 6.4 7.1 to 7.5 8.1,8.3,8.5,8.7	8
III	**Majority Carrier Diodes:** The Tunnel Diode, The Backward Diode, The Schottkey Barrier Diode, Ohmic Contacts Heterojunctions.	10.1 to 10.5	6
IV	**Microwave Diodes**: The Varactor Diode, The p-i-n Diode, The IMPATT Diode, TRAPATT Diode, The BARITT Diode, Transferred Electron Devices **Optoelectronic Devices**: The Solar Cell, Photo detectors, Light Emitting Diodes, Semiconductor Lasers.	11.1 to 11.6 12.1 to 12.4	8
V	**Metal Semiconductor Field Effect Transistors**: Basic Types of MESFETs, Models for I-V Characteristics of Short – Channel MESFETs, High Frequency Performance, MESFETs Structures. **MOS Transistors and Charge Coupled Devices:** Basic Structures and the Operating Principle, I-V Characteristics, Short-Channel Effects, MOSFET Structures, Charge Coupled Devices.	15.4 to 15.7 16.4 to 16.9	8
Text Book: M.S. Tyagi, “Introduction To Semiconductor Materials And Devices”, John Willy-India Pvt. Ltd.			
Reference Books: 1. S. M. Sze, “Physics of Semiconductor Devices”, 2nd Edition, John Willy-India Pvt. Ltd. 2. B. G. Streetman and S. Banerjee, “Solid state electronics devices”, 5th Edition, PHI.			

EIC 601 MICROCONTROLLER			3 1 0
Unit	Topic	Chapter/ Section	Proposed number of Lectures
I	Introduction , Microcontrollers and Embedded processors, Overview of the 8051, Inside the 8051, Addressing modes,	0.3, 1.1, 1.2, 2.1, 5.1-5.4,	6
II	Introduction to 8051 assembly programming, Assembling and running an 8051 program, The program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack, 8051 I/O programming, I/O bit manipulation programming.	2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 4.1, 4.2	8
III	Programming the 8051 timers, Counter programming, Basics of serial communications, 8051 connection to RS-232, 8051 serial port programming assembly, 8051 interrupts, Programming timer interrupts, programming external hardware interrupts, programming the Serial communication interrupts, Interrupts priority in the 8051,	9.1, 9.2, 10.1, 10.2, 10.3, 11.1, 11.2, 11.3, 11.4, 11.5	10
IV	Interfacing with 8051: Memory address decoding 8031/ 51 interfacing with external ROM, 8051 data memory space, LCD, Keyboard, Parallel and Serial ADC, DAC interfacing, Sensor interfacing and Signal Conditioning, Stepper motor and DC motor,	14.2, 14.3, 14.4, 12.1, 12.2, 13.1, 13.2, 13.3, 17.2, 17.3,	10
V	Programming the 8255 and Interfacing, Introduction to Intel 8096 and MC68HC11 microcontroller*.	15.1, 15.2, Text Book 2: Ch. 3 & 4	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and McKinlay Rolin D., “ The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson, 2nd Edition.
2. Chhabra Bhupendra Singh, “Microcontrollers & its Applications” Dhanpat Rai Publishing Company

Reference Book:

1. Ayala Kenneth, “The 8051 Microcontroller”, Cengage Learning, 3rd Edition
2. Shah Satish, “ 8051 Microcontrollers MCS 51 Family and its variants”, Oxford
3. Ghoshal Subrata, “ 8051 Microcontroller Internals, Instructions, Programming and Interfacing” Pearson

LABOROTARY

EEC 651 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and Decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11 Study of single bit error detection and correction using Hamming code.
12 Measuring the input impedance and Attenuation of a given Transmission Line

EEC-652 DIGITAL SIGNAL PROCESSING LAB

1. With the help of Fourier series, make a square wave from sine wave and cosine waves. Find out coefficient values.
2. Evaluate 4 point DFT of and IDFT of $x(n) = 1, 0 \leq n \leq 3$; 0 elsewhere.
3. Implement the FIR Filters for 2 KHz cutoff frequency and 2 KHz bandwidth for band pass filter.
4. Design FIR filter using Fourier series expansion method.
5. Implement IIR low pass filter for a 4 KHz cutoff frequency and compare it the FIR filter with the same type use chirp as input signal.
6. Verify Blackman and Hamming windowing techniques for square wave as an input which window will give good results.
7. Implement the filter functions.
8. Generate DTMF sequence 1234567890*# and observe its spectrogram.
9. Generate an Amplitude Modulation having side low frequencies 1200 Hz and 800 Hz. Observe and verify the theoretical FFT characteristics with the observed ones.
10. Generate Frequency Modulation having carrier frequencies 1 KHz and modulating frequency 200 Hz with the modulation index of 0.7. Observe and verify the theoretical FFT characteristics with the observed ones.
11. Generate an FSK wave form for transmitting the digital data of the given bit sequence. Predict and verify the FFT for the same one.
12. To study the circular convolution.

EEC-553 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a) Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a) Transient Analysis of NMOS inverter using step input.
   (b) Transient Analysis of NMOS inverter using pulse input.
   (c) DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b) Transient Analysis of CMOS inverter using step input with parameters.
   (c) Transient Analysis of CMOS inverter using pulse input.
   (d) Transient Analysis of CMOS inverter using pulse input with parameters.
   (e) DC Analysis (VTC) of CMOS inverter with and without parameters.
4. Transient & DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.

VHDL Experiments

1. Synthesis and simulation of Full Adder.
2. Synthesis and Simulation of Full Subtractor.
3. Synthesis and Simulation of 3 X 8 Decoder.
4. Synthesis and Simulation of 8 X 1 Multiplexer.

5. Synthesis and Simulation of 9 bit odd parity generator.
6. Synthesis and Simulation of Flip Flop (D, and T).

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Engineering
&
Bachelor of Computer Science & Information Technology

3rd Year (V & VI Semester)

(Effective from Session: 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session: 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NCS 505	Computer Architecture	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NCS 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NCS 061: Computational Geometry
2. NCS 062: Complexity Theory
3. NCS 063: Parallel Algorithm
4. NCS 064: Approximation & Randomized Algorithm
5. NCS 065: Concurrent System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 067: Distributed Database
3. NCS 068: E-Commerce
4. NCS 069: Advance DBMS
5. NCS 070: Human Computer Interface

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures***:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan,” Database Concepts”, McGraw Hill 2.Date C J, “ An Introduction to Database Systems”, Addision Wesley

3. Elmasri, Navathe, “ Fudamentals of Database Systems”, Addision Wesley
4. O’Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,”Database Management Systems”, Vikas Publishing House 2.Bipin C. Desai, “ An Introduction to Database Systems”, Gagotia Publications 3. Majumdar & Bhattacharya, “Database Management System”, TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. “Programming Languages: Design and Implementations” , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. “Programming Language Design Concept”, David A. Watt, Willey India
3. “Programming languages: Concepts and Constucts”, Ravi Sethi, Second Ed.,Pearson.
4. “Types and programming Languages”, Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, "Collaborative Web Development" Addison Wesley
2. Xavier, C, " Web Technology and Design" , New Age International
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
4. Bhave, "Programming with Java", Pearson Education
5. Herbert Schieldt, "The Complete Reference:Java", TMH. 6. Hans Bergsten, "Java Server Pages", SPD O'Reilly
6. Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education
7. Margaret Levine Young, "The Complete Reference Internet", TMH
8. Naughton, Schildt, "The Complete Reference JAVA2", TMH
9. Balagurusamy E, "Programming in JAVA", TMH

References:

1. Ramesh Bangia, "Internet and Web Design" , New Age International
2. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication
3. Deitel, "Java for programmers", Pearson Education
4. Chris Bates, "Web Programing Building Internet Applications", 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , "Principal of web Design" Vikash and Thomas Learning
6. Horstmann, "CoreJava", Addison Wesley

NCS- 505 Computer Architecture		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction**:. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Central Processing Unit:** Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.	8
II	**Control Unit:** Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	8
III	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues 9 performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8
IV	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.

2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:-

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. Vravice,Hamacher & Zaky, “Computer Organization”, TMH
3. Mano,” Computer System Architecture”, PHI
4. John P Hays, “ Computer Organization”, McGraw Hill
5. Tannenbaum,” Structured Computer Organization’, PHI 6.
P Pal chaudhry, ‘ Computer Organization & Design’, PHI

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if $x > y$ return $x^2 - y^2$, otherwise $y^2 - x^2$)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8

Textbooks:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003.
3.Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

NCS-061 Computational Geometry		3 1 0
Unit	Topic	Proposed Lectures
I	Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.	8
II	Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties	8
III	Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems	8
IV	Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham- sandwich cuts.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

NCS-062 Complexity Theory		3 1 0
Unit	Topic	Proposed Lectures
I	Models of Computation, resources (time and space), algorithms, computability, complexity.	8
II	Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.	8
III	Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.	8
IV	Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.	8
V	Probabilistically checkable proofs; Communication complexity; Quantum computation	8

Textbooks:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

NCS-063 Parallel Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.	8
II	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.	8
III	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.	8
IV	Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.	8
V	Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.	8

Textbooks:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill. 2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

NCS-064 Approximation and Randomized Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to probability and randomized algorithms. Examples of randomized algorithms . Basic inequalities, Random variables.	8
II	Max-cut and derandomization. Permutation routing in a hypercube. Basic Chernoff bound. Markov chains and random walks (2-SAT example, random walk on a path example). Cover times. Universal traversal sequences.	8
III	Generation of combinatorial arrays. Random constructions and derandomized algorithms.	8
IV	Introduction to Approximation Algorithms, Set cover, TSP ,Knapsack, bin packing, Euclidean TSP	8
V	LP duality introduction; set cover randomized rounding, Set cover via primal - dual , k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees	8

References:

1. Rajeev Motwani and Prabhakar Raghavan. Randomized Algorithms. Cambridge University Press, Cambridge, England, June 1995.
2. Michael Mitzenmacher and Eli Upfal. Probability and Computing. Cambridge University Press, 1st edition, 2005.
3. Sheldon M. Ross. Probability Models. Academic Press, Inc., 7th edition, 2000 4. V. Vazirani, Approximation Algorithms, Springer, 2001.

NCS-065 Concurrent Systems		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction to concurrent systems and Formal Methods:** Reactive systems, Formal methods for reactive systems, Labelled transition systems, Operational semantics for concurrent processes.	8
II	**Process Algebras**: Operators for process modelling, CCS, CSP, Pi-calculus	8
III	Asynchronous Pi Calculus	8
IV	Distributed Pi Calculus, Introduction to type systems	8
V	**Tools and Techniques:** Experimental practice on mobility workbench (MBW), concurrency workbench (CWB-NC), CTMC.	8

References:

1. Robin Milner: Communicating and mobile systems: The π-Calculus,Cambridge University Press, 1999
2. Matthew Hennessy: A distributed Pi-Calculus, Cambridge University Press, 2007
3. Davide Sangiorgi and David Walker: The π -Calculus: A theory of Mobile Processes, Cambridge , University Press, 2001
4. Manuals of MBW, CWB-NC,CTMC.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

Textbooks:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

TextBooks:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education .

Refrences:

1.Ceei and Pelagatti,'Distributed Database', TMH
2.Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-068 E-Commerce		2 1 0
Unit	Topic	Proposed Lectures
I	Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.	8
II	Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
IV	Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.	8
V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	8

Text Books:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison-Wesley.

2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International 3. Goel, Ritendra “E-commerce”, New Age International

4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education

5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH

6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

NCS-069 Advanced DBMS		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler	8
III	Distributed Transactions Management, Data Distribution,fragmentation and Replication Techniques,Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques	8

Text Books:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

References:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education 2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Uttar Pradesh Technical University, Lucknow

Syllabus

3rd Year

[Effective from Session 2015-16]

1. **B.Tech. Electronics Engineering**
2. **B.Tech. Electronics & Communication Engineering**
3. **B.Tech. Electronics & Telecommunication Engineering**

SEMESTER - V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System – I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab – 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

SEMESTER - VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC 0__	Departmental Elective – I	3	1	0	30	20	50	100	150	4
5	NEC 0__	Departmental Elective – II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab – II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654	Seminar	0	0	2	10	10	20	30	50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	25

Departmental Elective – I

1. NEC 011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices

Departmental Elective – II

1. NEC 021 Industrial Electronics
2. NEC 022 Microcontroller and its Applications
3. NEC 023 Analog Signal Processing
4. NEC 024 Advance Digital Design and Verilog

NEC 501 Integrated Circuits		
Unit	Topic	Proposed number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between f_t and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:**The Latch, The SR Flip-flop, CMOS Implementation of SR Flip-flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op-amp as a comparator, Zero crossing detector, Schmitt Trigger, Astablemultivibrator, Monostablemultivibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a MonostableMultivibrator Using the 555 IC, AstableMultivibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, “Microelectronic Circuits”, 6th Edition, Oxford University Press.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 2nd Edition.

Reference Books:

1. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Edition, Tata McGraw Hill.
2. BehzadRazavi, “Fundamentals of Microelectronics”, 2nd Edition, Wiley.
3. Mark N. Horenstein, “Microelectronic Circuits and Devices”, PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley.

NEC 502 Principles of Communication		
Unit	Topic	Proposed number of Lectures
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Needformodulation,BasebandandPass bandsignals,AmplitudeModulation: Doubleside bandwithCarrier(DSB-C),Doubleside bandwithoutCarrier, SingleSide BandModulation, DSB-SC,DSB-C,SSB Modulators and Demodulators,VestigialSideBand(VSB),Quadrature AmplitudeModulator, Radio Transmitterand Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems,StereophonicFM Broadcasting, ExamplesBased onMat Lab.	8
III	PulseModulation,DigitalTransmissionofAnalogSignals:SamplingTheorem anditsapplications, Pulse AmplitudeModulation (PAM),Pulse Width Modulation, Pulse PositionModulation. Their generationandDemodulation, DigitalRepresentation ofAnalogSignals,PulseCodeModulation(PCM),PCM System,Issuesindigitaltransmission:Frequency DivisionMultiplexing,Time DivisionMultiplexing,LineCoding andtheir Power Spectral density, T1 Digital System, TDMHierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation,VoiceCoders,SourcesofNoises,Frequency domainrepresentation ofNoise, Super position ofNoises, Linearfilteringof Noises,Mathematical Representation of Noise.	7
V	NoiseinAmplitudeModulation:Analysis,SignaltoNoiseRatio,Figureof Merit.NoiseinFrequencyModulation:Preemphasis,DeEmphasisandSNR Improvement, PhaseLocked LoopsAnalog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, “Principles of Communication Systems”, Tata McGraw Hill.

Reference Books:

1. B.P.Lathi,“ModernDigitalandAnalogcommunicationSystems”,3rd Edition,OxfordUniversityPress.
2. SimonHaykin,“Communication Systems”,4th Edition,Wiley India.
3. H.P.Hsu&D.Mitra,“AnalogandDigitalCommunications”,2nd Edition,TataMcGraw-Hill.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**No. of Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	8
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	8
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	8
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	8
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupt controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	8

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085", 5th Edition, Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", 2nd Edition, Tata McGraw Hill.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson.

NIC 501 Control System – I		
Unit	Topic	Proposed number of Lectures
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
III	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo&FaridGolnaraghi, “Automatic Control Systems”, 8th Edition, John Wiley India.

Reference Books:

1. William A. Wolovich, “Automatic Control Systems”, Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, “Feedback and Control Systems” Schaums Outlines Series, 3rd Edition, Tata McGraw Hill.
3. I. J. Nagrath& M. Gopal, “Control System Engineering”, New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	Topic	Proposed number of Lectures
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) ΩA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	8
II	**Point Sources and Their Arrays:** Introduction, Point Source ,Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures**: The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of λ/2 Antenna, Array of Two Driven λ/2 Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	8
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:**Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	8
IV	**Ground Wave Propagation:**Plane Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation:**Introduction, Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:**Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics	8

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", Fourth Edition, Tata McGraw Hill.

Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propogation", Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill.

LABOROTARY

NEC 551: Integrated Circuit Lab

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
    a. Low pass filter of cutoff frequency 1 KHz.
    b. High pass filter of frequency 12 KHz.
    c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50mA.
7. A/D and D/A convertor.
8. Voltage to current and current to voltage convertors.
9. Function generator using operational amplifier (sine, triangular & square wave)
10. Astable and monostablemultivibrator using IC 555.

NIC 551: Control System Lab

1. DifferentToolboxesinMATLAB,IntroductiontoControlSystemsToolbox.
2. Determinetranspose,inversevaluesofgivenmatrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plotunitstepresponseandtofindrisetimeanddelaytime.
7. Plotlocusofgiventransferfunction,locateclosedlooppolesfordifferentvaluesofk.
8. Plot root locusofgiventransferfunction and tofind outS,Wd,Wnatgivenroot &todiscuss stability.
9. Plotbodeplotofgiventransferfunction.
10. Plotbodeplotofgiventransferfunctionandfindgainandphasemargins
11. PlotNyquistplotforgiventransferfunctionandtocomparetheirrelativestability
12. PlottheNyquistplotforgiventransferfunctionandtodiscussclosedloopstability,gainand phasemargin.

Note:-Inaddition,Institutesmayincludemoreexperimentsbasedontheexpertise.

NEC 552: Communication Lab – 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.

7. To study Pulse Amplitude Modulation
    a. using switching method
    b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	Topic	Proposed number of Lectures
I	RectangularWaveGuide:FieldComponents,TE,TMModes,Dominant TE_{10} mode, FieldDistribution,Power, Attenuation.Circular Waveguides: TE,TMmodes. Wave Velocities,MicrostripTransmissionline(TL), CoupledTL, StripTL,CoupledStripLine,CoplanarTL,Microwave Cavities,	8
II	Scattering Matrix, Passivemicrowave devices: MicrowaveHybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: TwoHole directional couplers,SMatrix ofa Directional coupler,HybridCouplers, MicrowavePropagationinferrites,Faraday Rotation,Isolators,Circulators.Sparameteranalysis ofallcomponents.	8
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube,BackwardWave Oscillators:Their Schematic,Principle ofOperation, PerformanceCharacteristicandtheir applications.	8
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwavetunnel diode,MicrowaveField-effectTransistor,Transferred electron devices,Avalanche Transit –time devices:IMPATT Diode, TRAPPATDiode,	8
V	MicrowaveMeasurements:Generalsetupofamicrowavetestbench, Slottedlinecarriage, VSWRMeter,microwave powermeasurements techniques,CrystalDetector,frequency measurement,wavelength measurements,Impedance andRefection coefficient, VSWR,Insertion andattenuationlossmeasurements, measurementofantenna characteristics, microwave linkdesign.	8

Text Book:

1. Samuel Y. Liao, “MicrowaveDevices and Circuits”, 3rd Edition,PearsonEducation.

Reference Books:

1. R.E Collin, “Foundation forMicrowaveEngineering“, 2nd Edition, JohnWiley India.
2. A. DasandS.K.Das,“MicrowaveEngineering”,Tata McGraw Hill.

NEC 602 Digital Communication		
Unit	Topic	Proposed number of Lectures
I	DigitalDatatransmission, Linecoding review,Pulseshaping,Scrambling, Digitalreceivers,Eyediagram,Digitalcarriersystem,Methodofgeneration and detection of coherent &non-coherent binary ASK, FSK &PSK, Differentialphaseshiftkeying,quadraturemodulationtechniques.(QPSKand MSK),M-aryDigital carrierModulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum ofRandom Variables,CentralLimitTheorem,Random Process, ClassificationofRandom Processes,Powerspectral density,Multiplerandom processes,	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling,Coherent Receivers for DigitalCarrierModulations, Signal Space Analysisof Optimum Detection, VectorDecompositionof WhiteNoiseRandom processes,General Expression forError Probability ofoptimumreceivers,	8
IV	Spread spectrum Communications: Frequency Hopping Spread Spectrum (FHSS)systems,DirectSequenceSpreadSpectrum,CodeDivision Multiple Access ofDSSS, Multiuser Detection,OFDM Communications	8
V	MeasureofInformation,SourceEncoding,ErrorFreeCommunicationovera NoisyChannelcapacity ofa discreteandContinuous Memorylesschannel ErrorCorrectingcodes:Hammingsphere,hamming distanceandHamming bound,relationbetweenminimum distanceanderror detectingandcorrecting capability,Linear blockcodes,encoding& syndrome decoding; Cycliccodes, encoderanddecodersforsystematiccyclecodes;convolutioncodes,codetree &Trellisdiagram, Viterbiandsequentialdecoding,bursterrorcorrection, Turbocodes.	8

Text Book:

1. B.P.Lathi,“ModernDigitalandAnalogcommunicationSystems”,4th Edition,OxfordUniversityPress.

Reference Books:

1. H.Taub,D.L.Schilling,G.Saha,“PrinciplesofCommunication”,3rd Edition,TataMcGraw-Hill.
2. John G.Proakis,“Digital Communications”,4th Edition,McGraw-Hill International.
3. SimonHaykin,“Communication Systems”,4th Edition,Wiley India.
4. H.P.HSUandD.Mitra,“AnalogandDigitalCommunications”,2nd Edition,TataMcGraw-Hill.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Proposed number of Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated CircuitsCrystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques andSystems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition:Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, DiffusionEquations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid andGaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, ImplantationEquipment.	8
IV	Metallization: Metallization Application, Metallization Choices, PhysicalVapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging DesignConsideration, VLSI Assembly Technologies, Package FabricationTechnologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing,NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology,Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication.
2. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition, Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
2. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford University Press.

Laboratory
NEC 651 Antenna and Microwave Lab

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler,Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and Decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a)Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.

4. Transient &DC Analysis of NOR Gate inverter.
5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

Electives

NEC 011 Digital Signal Processing		
Unit	Topic	Proposed number of Lectures
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters**: Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation –In Time(DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, “Digital Signal Processing”, PHI.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, “Digital Signal Processing”, Pearson Education.
2. Oppenheim & Schafer, “Digital Signal Processing” PHI.
3. Sanjit K. Mitra, “Digital Signal Processing: A Computer-Based Approach”, 4thEdition, McGraw Hill.
4. Monson Hayes, “Digital Signal Processing”,2ndEdition, McGraw Hill Education

NEC 012 Computer Architecture and Organization		
Unit	Topic	Proposed number of Lectures
I	Introduction to Design Methodology: System Design – System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation – Basic formats, Fixed point numbers, Floating point numbers. Instruction sets – Formats, Types, Programming considerations.	8
III	Datapath Design: Fixed point arithmetic – Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts – introduction, hardwired control, Micro programmed control –introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches – Main features, Address mapping, structure vs performance, System Organisation: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes “Computer Architecture and Organisation”, 3rd Edition, McGraw Hill.

Reference Books:

1. M Morris Mano, “Computer System Architecture”,3rd Edition, Pearson.
2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, “Computer Organization and Embedded Systems”, McGraw Hill.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier.

NEC 013 Artificial Neural Network		
Unit	Topic	Proposed number of Lectures
I	**Introduction to ANN** Features , structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks -** History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch – Pitts model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture.	8
II	**Backpropagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, backpropagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks**: Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8
IV	**a)Feedforward neural networks –** - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b)Feedback neural networks** Pattern storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks :** Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network**.** **Applications of ANN :** Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron – Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, “Artificial neural Networks”, PHI.

Reference Books:

1. S. Raj Sekaran ,VijayalakshmiPari,” Neural networks, Fuzzy logic and Genetic Algorithms”, PHI.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, TMH.

NEC 014 Advance Semiconductor Devices		
Unit	Topic	Proposed number of Lectures
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator-Semiconductor Capacitors.	8
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	8
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	8
IV	Transferred-Electron and Real-Space-Transfer DevicesThyristors and Power Devices **Photonic Devices and Sensors:** Radiative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	8
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. **Sensors:**Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	8

Text Book:

1. S. M. Sze, Kwok K. NG, “Physics of Semiconductor Devices”, 3rd Edition, Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics Of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	Topic	Proposed number of Lectures
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	8
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	8
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	8
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	8

Text Books:

1. M. H. Rashid, “Power Electronics”, 3rd Edition, Pearson Education.

Reference Books:

1. M. D. Singh & K. Khanchandani, “Power Electronics”, Tata McGraw Hill.
2. V.R. Moorthy, “Power Electronics: Devices, Circuits and Industrial Applications”, Oxford University Press,2007.
3. M.S. JamilAsghar, “Power Electronics”,PHI.
4. Ned Mohan, T.M.Undeland and W.P.Robbins, “Power Electronics:Converters, Applications and Design”, Wiley India.

NEC 022 Microcontroller and it Applications		
Unit	Topic	Proposed number of Lectures
I	Introduction to microcontrollers and embedded systems, Von Neumann (Princetone) and Harvard architecture, RISC and CISC machine, overview of the 8051 family, general architecture (pins and signals, internal architecture, program memory and data memory organization, system clock, reset, programming technique), input/ output ports and special function registers, addressing mode.	8
II	Instruction groups of MCS-51: data transfer operation, arithmetic operations, branch operation, logical operation, Boolean variable manipulation, subroutine & stack operation and advance instructions. Assembler data type and directives, introduction to assembly programming and programming in C.	8
III	External interrupts and software interrupt, timer/ counter interrupt, interrupt service routine, programming 8051 timer, counter programming, Basic of serial communication, mode of serial communication, RS232, serial communication issue, serial port programming,	8
IV	Interfacing with 8051: external memory, 8255, keyboards, display devices, DAC/ADC, DC Motor, Stepper Motor, Servomotor, power management, Sensor interfacing and signal conditioning.	8

Text Book:

1. Mazidi Ali Muhammad, MazidiGillispie Janice, and McKinlayRolin D., “The 8051 Microcontroller and Embedded Systems using Assembly and C”, Pearson, 2nd Edition.
2. ChhabraBhupendra Singh, “Microcontrollers & its Applications” DhanpatRai Publishing Company, New Delhi

Reference Book:

1. Shah Satish, “8051 Microcontrollers MCS 51 Family and its variants”, Oxford
2. SubrataGhoshal, “8051 Microcontroller Internals, Instructions, Programming and Interfacing” Pearson
3. V. Udayashankara, M.S. Mallikajunaswamy, “8051 Microcontroller Hardware, Software and Applications”, McGraw-Hill.
4. DoganBrahim, “Microcontroller Projects in C for the 8051”, Newnes
5. SubrataGhoshal,“Embedded System & Robots Projects using the 8051 Microcontroller”, CengageLerning

NEC 023 Analog Signal Processing		
Unit	Topic	Proposed number of Lectures
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: nullor, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω_0), frequency response,effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R.Schaumann and M.E.Valkenberg,"Designof AnalogCircuits", Oxford University Press.

NEC 024 Advanced Digital Design and Verilog		
Unit	Topic	Proposed number of Lectures
I	Introduction to Mixed Logic, Logic Representation and Minimization with cost, Multiple output minimization, Entered Variable K- Map including don't care handling, XOR-Pattern Handling.	8
II	Combinational Circuit Design, Multiplexers, Decoders, Encoders, Code Comparators, Adders, Subtractors, Multipliers, Timing Analysis, Hazard Detection and Elimination.	8
III	Synchronous Sequential Circuits Design, Mapping Algorithm, Synchronous State Machines, ASM Charts, Asynchronous Sequential Circuit Design, Races, Multi level minimization and optimization.	8
IV	Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems, Path Sensitization method, Boolean Difference Method, Initial State Method.	8
V	Study of programmable logic families, PLD, CPLD, FPGA, ASIC, PLA, Architectures, Design of Combinational and sequential circuits using CPLD and FPGA, Design Examples.	8

Text Books:

1. Richard F. Tinder, “Engineering Digital Design”, Academic Press.
2. Parag K. Lala, “Digital system Design Using PLDs”, PHI India Ltd.

Reference Books:

1. John Williams, “Digital VLSI Design with Verilog”, Springer Publication.
2. Eugene Fabricius, “Modern Digital Design and Switching Theory”, CRC Press.
3. Samuel C. Lee, “Digital Circuit and Logic Design”, PHI India Ltd.
4. Alexander Miczo, “Digital Logic Testing and Simulation”,Wiley Interscience.
5. Stephen Brown and ZvonkoVranesiv, “Fundamental of Digital Logic with Verilog Design”, Tata McGraw Hill.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Electrical Engineering

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

<u>EVELUATION SCHEME OF ELECTRICAL ENGINEERING</u>

<u>Third Year</u>

ELECTRICAL ENGG- Semester-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501	Elements Of Power System	3	1	0	30	20	50	100	150	4
2	NEE 502	Power Electronics	3	1	0	30	20	50	100	150	4
3	NEE-503	Control System	3	1	0	30	20	50	100	150	4
4	NEE-504	Microprocessor & Its Applications	3	1	0	30	20	50	100	150	4
5	NEC-508	Fundamentals of E.M. Theory	2	1	0	15	10	25	50	75	3
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551	Power Electronics Lab	0	0	3	10	10	20	30	50	1
8	NEE 552	Control System Lab	0	0	3	10	10	20	30	50	1
9	NEE-553	Microprocessor Lab	0	0	2	10	10	20	30	50	1
10	NEE 554	Simulation Based Minor Project	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	1
		TOTAL	16	5	10					1000	26

ELECTRICAL ENGG. -Semester-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-601	Power System Analysis	3	1	0	30	20	50	100	150	4
2	NEE 602	Switchgear & Protection	3	1	0	30	20	50	100	150	4
3	NEE-603	Special Electric Machine	3	1	0	30	20	50	100	150	4
4	NEE-011 / NEE-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
5	NEE-021 / NEE-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651	Power System Lab	0	0	2	10	10	20	30	50	1
8	NEE-652	Electrical CAD Lab	0	0	3	10	10	20	30	50	1
9	NEE-653	Minor Project	0	0	2	10	10	20	30	50	1
10	NEE 654	Seminar	0	0	3		50	50		50	1
11	NGP 601	GP						50		50	1
		TOTAL	16	5	10					1000	26

Elective-I

NEE – 011: Digital Control System
NEE - 012: Fundamentals of Digital Signal Processing
NEE - 013: Neural Networks and Fuzzy System
NEE - 014: Power Theft and Energy Management

Elective-II

NEE – 021: High Voltage Engineering
NEE -022: Intelligent Instrumentation
NEE -023: Conventional & CAD of Electrical Machines
NEE -024: Smart Energy Delivery Systems

NEE-501: ELEMENTS OF POWER SYSTEM

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<u>Unit-I</u>

Power System Components:
Single line Diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System
Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:
Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.Proximity effect

Unit-II

Over Head Transmission Lines
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

Unit-III

Corona and Interference:
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators:
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

Unit-IV

Mechanical Design of transmission line:
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables:
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit-V

Neutral grounding:
Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line:
Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission:
Introduction to EHV AC and HVDC transmission lines.

Text Books

1.W. D. Stevenson, "Element of Power System Analysis", McGraw Hill,
2.C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3.Asfaq Hussain, "'Power System", CBS Publishers and Distributors,
4.B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5.M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

Reference Books

6.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & sons,
7.S. L. Uppal, "Electric Power", Khanna Publishers
8.S.N.Singh, " Electric Power Generation, Transmission& distribution." PHI Learning

NEE-502:POWER ELECTRONICS

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Unit-I

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics, specifications of switches, types of power electronic circuits,Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT

Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC

Unit-II

Power Semiconductor Devices (Contd.)

Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers and their various applications.

Unit-III

Phase Controlled Converters

Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters. Performance Parameters

Three phase half wave converters, three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls

Single phase ac voltage controller with resistive and inductive loads

Three phase ac voltage controllers (various configurations and comparison only)

Single phase transformer taps changer, industrial applications.

Cyclo Converters

Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation and their applications.

Unit-V

Inverters

Single phase series resonant inverter,Single phase bridge inverters,Three phase bridge inverters

Voltage control of inverters,Harmonics reduction techniques,Single phase and three phase current source inverters

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005
3. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press.

Reference Books:

4. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics &Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008.
7. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

NEE-503: CONTROL SYSTEM

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Unit-I

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit-II

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit-III

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor

Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique:

The root locus concepts, construction of root loci

Unit-IV

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain:

Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles

Unit-V

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:

Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, " Control Systems theory and Applications", Pearson Education

NEE-504: MICROPROCESSORS

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UNIT-I:

Introduction to Digital Computer and Microprocessor:

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II:

8-bit Microprocessors.

8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III:

16-bit Microprocessors: Architecture:

Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes**:** Instruction format:

Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types.

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V

Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter.

8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, “Microcomputers and Microprocessors” PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.

4. Krishna Kant, “Microprocessors and Microcontrollers” PHI Learning.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata Mc Graw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. N. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford University Press.
11. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family” Prentice Hall (India)

NEC-508: FUNDAMENTALS OF E.M.THEORY

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2 1 0

Unit I

Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation, divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density, Energy and potential.

Unit-II

Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations.

Unit-III

Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

Unit-IV

Uniform Plane waves, Plane wave reflection and dispersion

Text Books:

1. Hayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata Mc.Graw Hill Publishing
2. Mathew Sadiku, "Electromagnetic Field Theory", Oxford University Press.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
4. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition.
5. Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition

NEE-551: POWER ELECTRONICS LABORATORY

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Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.
17.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” Prentice hall Inc.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media,

NEE– 552: CONTROL SYSTEM LABORATORY

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Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

10. To simulate PID controller for transportation lag.
11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

NEE-553: MICROPROCESSOR LABORATORY

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A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

EEE-601: POWER SYSTEM ANALYSIS

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Unit-I

Representation of Power System Components:
Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:
Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II

Symmetrical fault analysis:
Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unsymmetrical faults:
Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations

Unit-III Load Flows:
Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations,
load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV

Power System Stability:
Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Unit-V Traveling Waves:
Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

NEE – 602: SWITCHGEAR AND PROTECTION

L T P
3 1 0

<u>Unit I:</u>

Introduction to Protection System:

Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

<u>Unit-II:</u>

Relay Application and Characteristics:

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:

Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III

Protection of Transmission Line:

Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

<u>Unit-IV:</u>

Circuit Breaking:

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:

Classification, testing station and equipments, testing procedure, direct and indirect testing

<u>Unit-V</u>

Apparatus Protection:

Protection of Transformer, generator and motor.

Circuit Breaker:

Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, “Fundamentals of Power System Protection”, Prentice Hall of India.
5. T.S.M Rao,“Power System Protection: Static Relays with Microprocessor Applications” Tata Macgraw Hill”.
6. A.R. Van C. Warringtaon , “ Protective Relays- Their Theory and Practice, Vol. I & II” Jhon Willey & Sons.

NEE-603: SPECIAL ELECTRICAL MACHINES

L T P
3 1 0

UNIT-I

Poly-phase AC Machines:
Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power)

UNIT-II

Single phase Induction Motors:
Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor-start capacitor-run and shaded pole motors.

Two Phase AC Servomotors:
Construction, torque-speed characteristics, performance and applications.

UNIT-III Stepper Motors:
Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:
Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT-IV

Permanent Magnet Machines:
Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V

Single Phase Commutator Motors:
Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “ Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001
3. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987
5. M.G. Say “ Alternating current Machines” Pitman & Sons .

DEPARTMENTAL ELECTIVES

ELECTIVE – I

NEE – 011: Digital Control System

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3 1 0

UNIT-I

Signal Processing in Digital Control:

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample- hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II

Design of Digital Control Algorithms:

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

UNIT-III

State Space Analysis and Design:

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

UNIT-IV

Stability of Discrete System:

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

UNIT-V

Optimal digital control :

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System",Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems:Theory, hardware, Software",Mc Graw Hill.

NEE - 012: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

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Unit-I

Discrete-Time Signals And Systems:
Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Discrete Fourier Transform:
Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit-II

Sampling of Continuous Time Signals:
Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III

Transform Analysis of LTI Systems:
Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase
Overview of finite precision numerical effects, effects of coefficient quantization,Effects of round-off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

Unit-IV

Filter Design Techniques:
Design of D-T IIR filters from continuous – time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation

Unit-V

Efficient computation of the DFT:
Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier Analysis of Signals Using DFT :
DFT analysis of sinusoidal signals, time-dependent Fourier transforms: Block convolution, Fourier analysis of non – stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. & Manolakis, D.G.,” Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall of India.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, Prentice Hall of India.
5. Oppenheim, Alan V. & Willsky, Alan S. , “Signals and Systems” , Prentice Hall of India, 2nd Edition
6. Johnson, J.R. , “Introduction to Digital Signal Processing”, Prentice Hall of India.

NEE - 013: NEURAL NETWORKS AND FUZZY SYSTEM

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Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule,
Auto-associative and hetro-associative memory

Unit-II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, "Neural Networks" Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications" Prentice Hall of India.

Reference Books:

3. Siman Haykin, "Neural Netowrks" Prentice Hall of India
4. Timothy J. Ross, "Fuzzy Logic with Engineering Applications" Wiley India.

NEE - 014: POWER THEFT AND ENERGY MANAGEMENT

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3 1 0

UNIT-I

Introduction: Energy sources, Energy demand and supply, Energy crisis, Future scenario,

Menace of power theft, reasons for power pilferage, electricity loss and theft-National and Global scenario, Security seals and tampering, harmonics and power theft, Control Over power theft.

UNIT-II

Power Theft in Electro-mechanical Meters: Power theft in Voltage circuit, by-passing meters, drilling holes on Electro-mechanical Meters, Insertion of film into meter, partial earth fault tampering, Missing Neutral Method.

Power Theft in Electronic Meters:

Power theft by means of Electrostatic Discharge, by tampering printed circuit board, by tampering the frequency circuit, tampering on display circuits of energy meter, Introducing limit switch.

UNIT-III

Energy system efficiency, Energy conservation aspects, Instrumentation and measurements.

Principles of Energy Management and Energy Audit: General principles, Planning and program, Introduction to energy audit, General methodology, Site surveys, Energy systems survey, Energy audit, Instrumentation, Analysis of data and results.

UNIT-IV

Electrical Load and Lighting Management: General principles, Illumination and human comfort, Lighting systems, Equipment's, Electrical systems, Electrical load analysis, Peak load controls.

Demand Side Management: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM

Text Books:

1. G.Sreenivasan, "Power Theft", PHI Learning Private Limited
2. Amlan Chakrabarti, "Energy Engineering and Management ", PHI Learning Private Limited
3. W R Murphy, G Mckay, 'Energy Management' B.S. Publications.

DEPARTMENTAL ELECTIVES
ELECTIVE – II

NEE – 021: HIGH VOLTAGE ENGINEERING

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2 1 0

UNIT-I

Break Down In Gases:
Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics:
Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectrics:
Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT-II

Generation of High Voltages and Currents:
Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of High Voltages and Currents:
Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

UNIT-IV

Non-Destructive Testing:
Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:
Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, McGraw Hill Education (India) Private Limited.

Reference Books:

2. E. Kuffel and W. S. Zacngal, High Voltage Engineering", Pergamon Press.
3. R. S. Jha, "High Voltage Engineering", Dhanpat Rai & sons
4. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.
5. M. Khalifa,' High Voltage Engineering Theory and Practice,' Marcel Dekker.
6. Subir Ray,' An Introduction to High Voltage Engineering' Prentice Hall of India

NEE -022: INTELLIGENT INSTRUMENTATION

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2 1 0

Unit – 1& 2

1. **Introduction: Introduction to Intelligent Instrumentation:**
   Historical Perspective, current status, software based instruments.
2. **Virtual Instrumentation:**
   Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

Unit-3

3. Data Acquisition Methods: Analog and Digital IO, Counters, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls.

Unit-4

4. PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing - RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI.

References:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall.
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall.
3. H. S. kalsi, “Electronic Instrumentation”, McGraw Hill Education (India) Private Limited.
4. S. Gupta , J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED./ Instrument Society of America, 1994.
5. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill.

NEE -023: CONVENTIONAL & CAD OF ELECTRICAL MACHINES

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2 1 0

UNIT-I

Basic Considerations:
Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials.
Calculation of total mmf and magnetizing current. Transformer Design:
Output equation design of core, yoke and windings, overall dimensions,
Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT-II
Design of rotating machines – I:
Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size.
Core and armature design of dc and 3-phase ac machines
UNIT-III
Design of rotating machines – II:
Rotor design of three phase induction motors.
Design of field system of DC machine and synchronous machines. Estimation of performance from design data.
UNIT-IV
Computer Aided Design
Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure.
Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.
Text Books:
1. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay," Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.
Reference Books:
3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C.Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

NEE -024: SMART ENERGY DELIVERY SYSTEMS

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2 1 0

UNIT I

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.

UNIT II

Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT III

Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT IV

Microgrids and Distributed Energy Resources: Concept of microgrid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley
4. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley Blackwell 19
5. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press

Reference Books:

1. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability: ", Artech House Publishers July 2011
2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press
3. Mladen Kezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "Substation Automation (Power Electronics and Power Systems)", Springer
4. R. C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication

NEE – 651: POWER SYSTEM LAB

L T P
0 0 3
1

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (x_d) and quadrature axis reactance (x_q) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (x_d) and sub transient quadrature axis reactance (x_q) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata Mc.Graw Hill.
2. T. K. Nagsarskar & M.S. Sukhija,’ Power System Analysis’ Oxford Universitry Press.

NEE=652: ELECTRICAL CAD LAB

L T P
0 0 3

1. Design of Single phase transformer.
2. Design of Three phase transformer.
3. Design of Single phase Induction Motor.
4. Design of Three phases Induction Motor.
5. Design of DC motor.
6. Design of DC generator.
7. Design of Single phase alternator.
8. Design of three phase alternator.
9. Design of Synchronous Motor.
10. Design of lag, lead and lag-lead compensator.

Text Books:-

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
3. D.P. Kothari & I J Nagrath, "Electric Machine", McGraw Hill Education (India) Private Limited, Sigma Series.
4. S.K. Bhattacharya, "Electrical Machine", McGraw Hill Education (India) Private Limited.
5. Bhag S, Guru and Huseyin R.Hiziroglu, " Electric machinery and Transformers", Oxford University Press.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

3rd Year

[Effective from session 2015-16]

1. B. Tech. Mechanical Engineering
2. B. Tech. Production Engineering
3. B. Tech. Industrial & Production Engineering
4. B. Tech. Mechanical & Industrial Engineering

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering
[Effective from Session 20015-16]
YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NME-505	I.C. Engines & Compressors	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering
[Effective from Session 20015-16]
YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NME-604	Refrigeration & Air-conditioning	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-014	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NME-654	Refrigeration & Air Conditioning Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I
1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II
1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20015-16]
YEAR III, SEMESTER-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-501	Machine Design-I	2	1	0	15	10	25	50	75	3
2	NME-502	Kinematics of Machines	3	1	0	30	20	50	100	150	4
3	NME-503	Manufacturing Science& Technology-II	3	1	0	30	20	50	100	150	4
4	NME-504	Heat & Mass Transfer	3	1	0	30	20	50	100	150	4
5	NPI-501	Production Planning & Control	3	1	0	30	20	50	100	150	4
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-551	Machine Design-I Lab	0	0	2	10	10	20	30	50	1
8	NME-552	Seminar	0	0	2	--	--	50	--	50	1
9	NME-553	Manufacturing Technology-II Lab	0	0	3	10	10	20	30	50	1
10	NME-554	Heat & Mass Transfer Lab	0	0	3	10	10	20	30	50	1
11	NGP-501	General Proficiency	--	--	--	--	--	50	--	50	
		TOTAL	16	5	10					1000	25

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20015-16]
YEAR III, SEMESTER-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NME-602	Machine Design-II	3	1	0	30	20	50	100	150	4
2	NME-603	Dynamics of Machines	3	1	0	30	20	50	100	150	4
3	NPI-601	Principles of Machine Tool Design	3	1	0	30	20	50	100	150	4
4	NME-011 to NME-015	Departmental Elective - I	3	1	0	30	20	50	100	150	4
5	NME-021 to NME-024	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NME-651	Fluid Machinery Lab	0	0	3	10	10	20	30	50	1
8	NME-652	Machine Design-II Lab	0	0	2	10	10	20	30	50	1
9	NME-653	Theory of Machines Lab	0	0	2	10	10	20	30	50	1
10	NPI-651	Machine Tool Design Lab	0	0	3	10	10	20	30	50	1
11	NGP-601	General Proficiency						50		50	
		TOTAL	16	5	10					1000	25

Note- 4 to 6 Weeks Industrial Training-II after VI semester also to be evaluated in VII semester

Departmental Electives:

Department Elective - I

1. NME-011 Engineering Optimization
2. NME-012 Finite Element Methods
3. NME-013 Mechanical Vibrations
4. NME-014 Mechatronics

Department Elective - II

1. NME-021 Fluid Machinery
2. NME-022 Product Design & Development
3. NME-023 Reliability Engineering
4. NME-024 Unconventional Manufacturing Processes

NME-501 : MACHINE DESIGN-I **L T P**
2 1 0

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

3

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

4

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

4

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

4

UNIT III

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

4

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

4

UNIT IV

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

4

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

3

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion

6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-502 : KINEMATICS OF MACHINES **L:T:P 3: 1: 0**

Unit I

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain. **4**

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, slider crank mechanism and quick return motion mechanism, rubbing velocity at a pin joint, instantaneous center method, types and locations of instantaneous center, Kennedy's theorem, velocities in four bar mechanism and slider crank mechanism. **4**

Unit II

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism, Klein's construction for slider crank mechanism and four bar mechanism, analytical method for slider crank mechanism. **4**

Kinematic synthesis of mechanism:

Introduction, dimensional synthesis of mechanisms, motion, path and function generation, Chebyshev spacing, three position synthesis, graphical approach for four link mechanisms, straight line mechanisms, special mechanisms – indicator diagram mechanisms, steering mechanisms, Hook's Joint **4**

Unit III

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration, simple harmonic and cycloidal motions of follower. Analytical methods for cam profile. **8**

Unit IV

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, interference and undercutting in involute gear teeth, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train. **8**

Unit V

Friction drives

Introduction, belt and rope drives, open and crossed belt drives, velocity ratio, slip, power transmission, effect of mass of belt on power transmission, maximum power transmission, initial tension and maximum tension, pivots and collars, uniform pressure and uniform wear, clutches. **8**

Books:

1. Theory of Mechanisms and Machines: A Ghose and A K Malik, East West Press Pvt Ltd.
2. Theory of Mechanisms and Machines: J JUicker, G R Pennock and J E Shigley, Oxford University Press.
3. Kinematics and dynamics of machinery: C E Wilson and J E Sadler: PEARSON
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Machines: S S Rattan, McGraw Hill
6. Theory of Machines: Thomas Bevan, Pearson

NME-503: MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**
3 1 0

Unit I
Metal Cutting-
Mechanics of metal cutting.Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants.Tool materials. Tool wear and tool life. Machinability.Dynamometer, Brief introduction to machine tool vibration and surface finish.Economics of metal cutting.
9

Unit-II
Machine Tools
(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout
2

(ii) Shaper, slotter, planer: Construction, operations & drives.
1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.
2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.
2

Unit-III
Grinding &Super finishing
(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding
4

(ii) Super finishing: Honing, lapping and polishing.
1

Limits, Fits & Tolerance and Surface roughness:
Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.
3

Unit-IV
B. Metal Joining (Welding)
Survey of welding and allied processes.Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters.Resistance welding - spot, seam projection etc.Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds and

remedies. Weld decay in HAZ.

10

Unit-V

C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma-arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.
4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

NME-504 : HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1

Introduction to Heat Transfer:

Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :

General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :

Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2

Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

5

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

NME-505 : I C ENGINES & COMPRESSORS **L T P**

3 1 0

Unit-1

Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.
Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles
Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.

8

Unit–II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.
Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine
Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

9

Unit–III

CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.
Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings
Exhaust emissions from SI engine and CI engine and it's control

9

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.
Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.
Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

9

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.
Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

7

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

NPI-501: PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization
4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning
4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing
9

Unit-III
Production Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.
6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.
7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)
10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

NME-551 : MACHINE DESIGN-I Lab **L T P**

0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

NME-553 : MANUFACTURING TECHNOLOGY -II – LAB **L T P**

0 0 3

Minimum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

15. Experiment on unconventional machining.
16. Experiment on unconventional welding.
17. Experiment on TIG/MIG Welding.
18. Macro and Microstructure of welding joints.

NME-554 : HEAT & MASS TRANSFER – LAB **L T P**

0 0 3

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction **-** Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection **-** Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection **-** Heat transfer through fin**-**(natural convection) .
9. Convection **-** Heat transfer through tube/fin-(forced convection).
10 Convection **-** Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger **-** Parallel flow experiment
14. Heat exchanger **-** Counter flow experiment

NME-602: MACHINE DESIGN-II **L T P**
3 1 0

UNIT I

Principle of transmission and conjugate action

Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears

Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

6

UNIT II

Bevel gears

Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

NME-603 : DYNAMICS OF MACHINES

L T P
3 1 0

Unit I

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

7

Unit II

Gyroscope:

Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopicstabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

4

Mech. Vibrations:

Types of Vibration, Degrees of freedom. Longitudinal Vibration: Single degree free and damped vibration. Forced vibration of single degree under harmonic excitation.Vibration isolation.Whirling of shaft and critical speed.

5

Unit III

Balancing:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,balancing of single cylinder engine, balancing of multi cylinder inline engines.

8

Unit IV

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor, Controlling force diagrams for Porter governor and spring controlled governors.

8

Unit V

Brakes and dynamometers:

Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

8

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

NME-604 : REFRIGERATION & AIR CONDITIONING **L T P**
3 1 0

Unit-1
Refrigeration:
Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.
Air Refrigeration cycle:
Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2
Vapour Compression System:
Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3
Vapour Absorption system;
Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:
Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4
Air Conditioning:
Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5
Refrigeration Equipment & Application:
Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:
1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

NPI- 601 : PRINCIPLES OF MACHINE TOOL DESIGN **L T P**
3 1 0

Unit-I
Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc.General requirement of machine tool design.Machine tool design process. Tool wear, force Analysis.

9

Unit-II
Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, election of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms. Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

8

Unit-III
Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

7

Unit-IV
Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

3

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports.

3

Layout of bearings, selection of bearings machine tools

2

Unit-V
Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools.

5

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls.Basics of numerical controls.Machine tool testing.

3

Books :
1. Machine Tools Design & Numerical Controls by N.K. Mehta, McGraw-Hill
2. Design of Machine Tools by S.K. Basu Allied Publishers.
3. Principles of Machine Tools by Bhattacharya and Sen. New Central Book Agency.
4. Machine Tool Design Handbook by CMTI, McGraw-Hill.

NME-011 : ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduction:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Intgerlinear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern searchmethods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's andVariable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem fromarithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization,Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

NME-012: FINITE ELEMENT METHODS **L T P**
3 1 0

Unit 1
Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.
Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II
Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III
Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin's method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV
Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials.
Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V
Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.
Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning
3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

NME-013 : MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I

Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

5

UNIT - II

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments

8

UNIT- III

Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts**.**

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

NME-014: MECHATRONICS **L T P**
3 1 0

Unit 1
Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.
Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II
Electronics elements in mechatronics, conductors, insulators and semi conductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semi conductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.
Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III
System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.
Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV
Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.
Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V
Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, “Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, “Introduction to Mechatronics & Measurement Systems, 4e”, McGraw-Hill Education, 2014.
3. M Jouaneh, “Fundamentals of Mechatronics”, Cengage Learning, 2013.
4. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
6. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, “Mechatronics”, McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. “Mechatronics: Integrated Mechanical Electronic Systems”, Wiley

NME-021 : FLUID MACHINERY **L T P**
2 1 0

UNIT-I

Introduction: Impulse of Jet and Impulse Turbines:

Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler’s fundamental equation.Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat *&* *c*urve),Classification of turbines, Impulse turbines, Constructional details, Velocity triangles,Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II

Reaction Turbines:

Francis and Kaplan turbines, Constructional details, Velocity triangles, Power andefficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principlesof similarity, Unit and specific speed, Performance characteristics, Selection of waterturbines.

8

UNIT-III

Centrifugal Pumps:

Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficienciesof centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV

Positive Displacement and other Pumps:

Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.
Hydraulic ram, Jet pumps, Air lift pumps.

8

BOOKS:

1. Hydraulic Machines by JagdishLal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.

10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

NME -022: PRODUCT DESIGN & DEVELOPMENT **L T P**
2 1 0

UNIT I:
Introduction to Product Design, Applications, Relevance, Product Definition, Scope, Design definitions, The role and nature of design, Old and new design methods, Design by evolution vs design by innovation. Examples such evolution of bicycle, safety razor etc. Need based development, Technology based developments. Physical realisability& Economic feasibility of design concepts.

8

UNIT II:
Morphology of Design, Divergent, Transformation and Convergent phases of product design, Identification of need, Analysis of need, Design criteria, Functional aspects, Aesthetics, ergonomics, form (structure). Shape, size, color, Creativity, Mental blocks in creativity, Removal of blocks, Ideation Techniques.

8

UNIT III:
Transformations stage of design, Brainstorming &Synectics, Morphological techniques, Utility concept, Utility value, Utility index, Economic aspects of design, Fixed and variable costs, Break-even analysis, Product Appraisal Information and literature search, patents, standards and codes, Environment and other safety considerations in product design.

8

UNIT IV:
Reliability, Reliability considerations in product design, Bath tub curve, Reliability of systems in series and parallel. Failure rates, MTTF and MTBF, Optimum spares from reliability consideration, Design of displays and controls, Man-Machine interface, Compatibility of displays and controls, Ergonomic aspects of design, Anthropometric data and its importance in design

8

Books and references:

1. Product Design & Manufacturing **-** A.K.Chitale&R.C.Gupta, Prentice Hall.
2. Engg . Product Design -C .D. Cain, Bussiness Books.
3. Product Design by Otto and Wood- Pearson
4. Industrial design for Engineers –W .H. Mayall, Itiffe.
5. Product Design & Decision Theory - M.K. Starr - Prentice Hall
6. The Technology of Creation Thinking - R.P. Crewford – Prentice Hall.
7. Design Methods – seeds of human futures – J. Christopher Jones, John Wiley & Sons.
8. Human Factor Engg. – Mccormick E.J., McGraw-Hill.
9. Industrial Design In Engineering – A marriage of Techniques – Charles H .Flurscheim, The Design Council **-** London.

NME-023: RELIABILITY ENGINEERING **L T P**
2 1 0

UNIT-I
Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.
6

UNIT-II
Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.
8

UNIT-III
Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.
10

UNIT-IV
Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance
4

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.
4

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

NME-024 : UNCONVENTIONAL MANUFACTURING PROCESSES **L T P**
2 1 0

UNIT-I
Introduction, Limitations of conventional manufacturing processes, Need for unconventional manufacturing processes, its classification and future possibilities, Hybrid processes
4

Unconventional Machining Process based on material removal by abrasion, Principle and working and applications Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet machining and Ultrasonic Machining.
4

UNIT-II
Thermoelectric unconventional methods, Principle, working and applications of Plasma Arc Machining, Laser Beam Machining, Electron Beam Machining etc

4

Working principle and applications of Electric Discharge Machining, EDM machines, EDM process characteristics, Wire electric discharge machining

4

UNIT-III

Electro-chemical machining processes, ECM, its working principle, advantages and applications, Electro-chemical grinding, Electro-chemical deburring, Chemical machining.
Unconventional welding processes: Explosive welding, Cladding etc., Under water welding, Metalizing, Plasma are welding/cutting etc.

8

UNIT-IV

Unconventional Forming processes: Principle, working and applications of High energy forming processes such as Explosive Forming, Electromagnetic forming, Electro-discharge forming, water hammer forming, explosive compaction etc.

5

Electronic-device Manufacturing, Diffusion and Photo- Lithography process for electronic-device manufacturing.

3

Books and references:

1. Modern Machining Processes – P.C. Pandey
2. Advanced Machining Processes, V.K. Jain, Allied Publishers.
3. Handbook of Manufacturing Processes, James G Bralla, Industrial Press.

NME-651 : FLUID MACHINERY Lab — **L T P** / **0 0 3**

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

NME-652 : MACHINE DESIGN-II Lab **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as C and C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

NME-653 : THEORY OF MACHINES LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

NME-654 : REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 3

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.

6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

NPI-651 : MACHINE TOOL DESIGN LAB **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Measurement and analysis of cutting forces in orthogonal turning.
2. Flank wear – time characteristics for single point cutting tools.
3. (i) Checking the level of installation of a lathe in horizontal & vertical planes

   (ii) Checking the bed ways for straightness and parallelism.
4. Testing the main spindle of a lathe for axial movement and true running.
5. Process capability determination of a center lathe.
6. Flatness checking of a surface plate.
7. A study of devices for intermittent motion used in machine tools e.g. ratchet gear & Geneva Mechanism.
8. A study of Kinematics structure of lathe/milling machine.
9. A study of the drives for reciprocation used in machine tools.
10. Development the speed chart and gearing diagram for a gassed head lathe.
11. A study of the cone pulley drive in center lathe and development of its raydiagram for the speed structure.
12. Efficiency testing of lathe at various parameters-values.
13. Accuracy analysis of finished cylindrical work-pieces produced on a lathe.
14. Cutting (turning) with inclined placed tool (in tool fixture).
15. Turning with two simultaneously cutting tool (one from front on usual tool postand the other tool from back on tool-fixture on carriage)

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Engineering
&
Bachelor of Computer Science & Information Technology

3rd Year (V & VI Semester)

(Effective from Session: 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session: 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NCS 505	Computer Architecture	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
	PRACTICAL/DESIGN/DRAWING										
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NCS 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NCS 061: Computational Geometry
2. NCS 062: Complexity Theory
3. NCS 063: Parallel Algorithm
4. NCS 064: Approximation & Randomized Algorithm
5. NCS 065: Concurrent System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 067: Distributed Database
3. NCS 068: E-Commerce
4. NCS 069: Advance DBMS
5. NCS 070: Human Computer Interface

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures*:*** Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date C J, " An Introduction to Database Systems", Addision Wesley
3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley
4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications 3. Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NCS- 505 Computer Architecture		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction**:. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Central Processing Unit:** Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.	8
II	**Control Unit:** Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	8
III	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues 9 performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8
IV	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.

2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:-

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. Vravice,Hamacher & Zaky, “Computer Organization”, TMH
3. Mano,” Computer System Architecture”, PHI
4. John P Hays, “ Computer Organization”, McGraw Hill
5. Tannenbaum,” Structured Computer Organization’, PHI 6.
P Pal chaudhry, ‘ Computer Organization & Design’, PHI

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return $x^2 - y^2$, otherwise $y^2 - x^2$)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8

Textbooks:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley

5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003.
3.Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

NCS-061 Computational Geometry		3 1 0
Unit	Topic	Proposed Lectures
I	Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.	8
II	Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties	8
III	Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems	8
IV	Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham- sandwich cuts.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

NCS-062 Complexity Theory		3 1 0
Unit	Topic	Proposed Lectures
I	Models of Computation, resources (time and space), algorithms, computability, complexity.	8
II	Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.	8
III	Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.	8
IV	Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.	8
V	Probabilistically checkable proofs; Communication complexity; Quantum computation	8

Textbooks:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

NCS-063 Parallel Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.	8
II	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.	8
III	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.	8
IV	Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.	8
V	Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.	8

Textbooks:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill. 2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

NCS-064	Approximation and Randomized Algorithms	3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to probability and randomized algorithms. Examples of randomized algorithms . Basic inequalities, Random variables.	8
II	Max-cut and derandomization. Permutation routing in a hypercube. Basic Chernoff bound. Markov chains and random walks (2-SAT example, random walk on a path example). Cover times. Universal traversal sequences.	8
III	Generation of combinatorial arrays. Random constructions and derandomized algorithms.	8
IV	Introduction to Approximation Algorithms, Set cover, TSP ,Knapsack, bin packing, Euclidean TSP	8
V	LP duality introduction; set cover randomized rounding, Set cover via primal - dual , k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees	8

References:

1. Rajeev Motwani and Prabhakar Raghavan. Randomized Algorithms. Cambridge University Press, Cambridge, England, June 1995.
2. Michael Mitzenmacher and Eli Upfal. Probability and Computing. Cambridge University Press, 1st edition, 2005.
3. Sheldon M. Ross. Probability Models. Academic Press, Inc., 7th edition, 2000 4. V. Vazirani, Approximation Algorithms, Springer, 2001.

NCS-065 Concurrent Systems		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction to concurrent systems and Formal Methods:** Reactive systems, Formal methods for reactive systems, Labelled transition systems, Operational semantics for concurrent processes.	8
II	**Process Algebras**: Operators for process modelling, CCS, CSP, Pi-calculus	8
III	Asynchronous Pi Calculus	8
IV	Distributed Pi Calculus, Introduction to type systems	8
V	**Tools and Techniques:** Experimental practice on mobility workbench (MBW), concurrency workbench (CWB-NC), CTMC.	8

References:

1. Robin Milner: Communicating and mobile systems: The π-Calculus,Cambridge University Press, 1999
2. Matthew Hennessy: A distributed Pi-Calculus, Cambridge University Press, 2007
3. Davide Sangiorgi and David Walker: The π -Calculus: A theory of Mobile Processes, Cambridge , University Press, 2001
4. Manuals of MBW, CWB-NC,CTMC.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

Textbooks:

1. Alex Berson, Stephen J. Smith “Data Warehousing, Data-Mining & OLAP”, TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, “ Data Warehousing: Architecture and Implementation”, Pearson
3. Margaret H. Dunham, S. Sridhar,”Data Mining:Introductory and Advanced Topics” Pearson Education
4. Arun K. Pujari, “Data Mining Techniques” Universities Press
5. Pieter Adriaans, Dolf Zantinge, “Data-Mining”, Pearson Education

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

TextBooks:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education .

Refrences:

1.Ceei and Pelagatti,'Distributed Database', TMH
2.Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-068 E-Commerce		2 1 0
Unit	Topic	Proposed Lectures
I	Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.	8
II	Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
IV	Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.	8
V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	8

Text Books:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison-Wesley.

2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International 3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

NCS-069 Advanced DBMS		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler	8
III	Distributed Transactions Management, Data Distribution,fragmentation and Replication Techniques,Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques	8

Text Books:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

References:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education 2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW

Syllabus

3rd Year

[Effective from Session 2016-17]

1. **B.Tech. Electronics Engineering**
2. **B.Tech. Electronics & Communication Engineering**
3. **B.Tech. Electronics & Telecommunication Engineering**

SEMESTER-V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501R	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System -I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551R	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab - 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

CT Class Test **AT** Attendance **TA** Tutorial Assignment
ESE End Semester Examination
L/T/P Lecture/ Tutorial/ Practical

SEMESTER-VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC0_	Departmental Elective -I	3	1	0	30	20	50	100	150	4
5	NEC0_	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab - II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654R	Seminar	0	0	1	10	10	20	-	20	1
11	NEC 655	Microcontrollers for Embedded Systems Lab	0	0	1	6	6	12	18	30	1
12	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	26

Departmental Elective –I

1. NEC011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices
5. NEC013R Real Time Systems

Departmental Elective - II

1. NEC 021 Industrial Electronics
2. NEC 022R Microcontroller for Embedded Systems
3. NEC 023 Analog Signal Processing
4. NEC 024R Advance Digital Design using Verilog

NEC 501R Integrated Circuits		
Unit	Topic	Number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors**,** Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, “Microelectronic Circuits”, 6thEdition, Oxford University Press.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 2nd Edition.

Reference Books:

1. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Edition, Tata McGraw Hill.
2. Behzad Razavi, “Fundamentals of Microelectronics”, 2nd Edition, Wiley.
3. Mark N. Horenstein, “Microelectronic Circuits and Devices”, PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf

6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

NEC 502 Principles of Communication		
Unit	**Topic**	**Lectures**
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Nedformodulation,Baseband and Pass band signals, Amplitude Modulation: Double side bandwidth Carrier(DSB-C),Double side band without Carrier, Single Side Band Modulation, DSB-SC,DSB-C,SSB Modulators and Demodulators, Vestigial Side Band (VSB),Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	8
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM),PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-Emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops: Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill Publication.

Reference Books:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.Hsu &D.Mitra,"Analog and Digital Communications", Tata McGraw-Hill Publication.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	**8**
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	**8**
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	**8**
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	**8**
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupts controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	**8**

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085",Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill Publication.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer Publication.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson Publication.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill Publication.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson Publication.

NIC 501 Control System -I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
in	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", John Wiley India Publication.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Feedback and Control Systems" Schaums Outlines Series, Tata McGraw Hill Publication.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	**Topic**	**Lectures**
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) QA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	**8**
II	**Point Sources and Their Arrays:** Introduction, Point Source, Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures:** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of $\lambda/2$ Antenna, Array of Two Driven $\lambda/2$ Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	**8**
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	**8**
IV	**Ground Wave Propagation: Plane** Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation: Introduction,** Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics.	**8**

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", Tata McGraw Hill Publication.

Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propogation", Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI Publication.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill Publication.

LABOROTARY

NEC 551R INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for –
    a. Low pass filter of specified cutoff frequency
    b. High pass filter of specified frequency
    c. Band pass filter with unit gain of specified pass band
    d. Design a notch filter to eliminate 50Hz power line frequency
4. Wien bridge oscillator using operational amplifier.
5. Astable and monostable multivibrator using IC 555.
6. Design the following amplifiers:
    a. A unity gain amplifier
    b. A non-inverting amplifier with a gain of ’A’
    c. An inverting amplifier with a gain of ‘A’
    d. Log and antilog amplifiers.
    e. Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency ‘f’. Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

NIC 551: Control System Lab

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plot unit step response and to find rise time and delay time.
7. Plot locus of given transfer function, locate closed loop poles for different values of k.
8. Plot root locus of given transfer function and to find out S, Wd, Want given root & to discuss stability.
9. Plot Bode plot of given transfer function.
10. Plot Bode plot of given transfer function and find gain and phase margins
11. Plot Nyquist plot for given transfer function and to compare the irrelative stability
12. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain

and phase margin.

Note:-In addition to it, Institutes may include more experiments based on the expertise.

NEC 552: Communication Lab - 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
   a. using switching method
   b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-Uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	**Topic**	**Lectures**
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Microstrip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	**8**
II	Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. Spara meter analysis of all components.	**8**
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	**8**
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit -time devices: IMP ATT Diode, TRAPPAT Diode.	**8**
V	Microwave Measurements: General setup of a microwave testbench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	**8**

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson Education Publication.

Reference Books:

1. R.E Collin, "Foundation for Microwave Engineering", John Wiley India Publication
2. A. Das and S.K. Das," Microwave Engineering", Tata McGraw Hill Publication.

NEC 602 Digital Communication		
Unit	**Topic**	**Lectures**
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques.(QPSK and MSK),M-ary Digital carrier Modulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes.	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	8
IV	Spread Spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	8
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memoryless channel Error Correcting codes: Hamming sphere, Hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	8

Text Book:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press Publication.

Reference Books:

1. H. Taub, D.L. Schilling, G. Saha,"Principles of Communications", McGraw-Hill International Publication.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.HSU and D.Mitra,"Analog and Digital Communications", TataMcGraw-Hill Publication.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor -Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, "VLSI Technology", McGraw Hill Publication.
2. S.K. Ghandhi, "VLSI Fabrication Principles", Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, Practice and Modelling", Pearson Education Publication.
2. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press.

Laboratory

NEC 651 ANTENNA AND MICROWAVE LAB

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator.
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anti-Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.

4. Transient & DC Analysis of NOR Gate inverter.

5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

NEC 655 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

Electives Subjects

NEC 011 Digital Signal Processing		
Unit	**Topic**	**Lectures**
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters:** Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation -In Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, "Digital Signal Processing", PHI Publication.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI Publication.
3. Sanjit K. Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill Publication.
4. Monson Hayes, "Digital Signal Processing", McGraw Hill Education Publication.

NEC 012 Computer Architecture and Organization		
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8

III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.

NEC 013 Artificial Neural Network		
Unit	**Topic**	**Lectures**
I	**Introduction to ANN** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks -** History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture.	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8

IV	**a)Feedforward neural networks -** - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran , Vijayalakshmi Pari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

NEC-013R REAL TIME SYSTEMS		
Unit	**Topic**	**Lectures**
I	**Introduction to Real Time System** Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8

II	**Embedded Hardware for Real Time System** Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware – On chip Peripherals and Communication protocols** Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART. **Introduction to the CCS IDE:** its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. **Programming:** demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.

3. Hamid A. Toliyat and Steven G. Campbell, “DSP based Electromechanical Motion Control” CRC Press Publication.
4. Jean J Labrosse, “Embedded System Design blocks”, CMP books Publication
5. John H Davies, “MSP430 Microcontroller Basics” Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication.

NEC 014 Advance Semiconductor Devices		
Unit	**Topic**	**Lectures**
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator - Semiconductor Capacitors.	**8**
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	**8**
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	**8**
IV	Transferred-Electron and Real-Space-Transfer Devices Thyristors and Power Devices **Photonic Devices and Sensors:** Radioative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	**8**
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. Sensors: Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	**8**

Text Book:

1. S. M. Sze, Kwok K. NG, "Physics of Semiconductor Devices", Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	**Topic**	**Lectures**
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor -Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	**8**
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	**8**
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	**8**
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	**8**

Text Books:

1. M. H. Rashid, "Power Electronics", Pearson Education Publication.

Reference Books:

1. M. D. Singh & K. Khanchandani, "Power Electronics", Tata McGraw Hill Publication.
2. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press,
3. M.S. Jamil Asghar, "Power Electronics", PHI Publication.

NEC 022R Microcontrollers for Embedded Systems		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers.	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	8
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and Mc Kinlay Rolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide..

NEC 023 Analog Signal Processing		
Unit	**Topic**	**Lectures**
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: null or, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω0), frequency response, effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R. Schaumann and M.E. Valkenberg," Design of Analog Circuits", Oxford University

NEC 024R Advanced Digital System Design using Verilog		
Unit	**Topic**	**Lectures**
I	**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools. **Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.	8
II	**Gate Level Modeling:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits. **Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.	8

III	**Behavioral Modeling:** Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow i*f* and i*f*-else constructs, Assign-De-Assign construct, Repeat construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event. **Switch Level Modeling:** Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.	8
IV	**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives. **Sequential Circuit Description:** Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.	8
V	**Components Test and Verification:** Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification. Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems.	8

Text Books:

1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL", Wiley Publication.

2. Zainalabdien Navabi, Verilog Digital System Design, TMH Publication.

3. Richard F. Tinder, "Engineering Digital Design", Academic Press Publication.

Reference Books:

1. Stephen. Brown and Zvonko Vranesic," Fundamentals of Logic Design with Verilog Design", TMH Publication.

2. Sunggu Lee ,"Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA ", Cengage Learning Publication.

3. Samir Palnitkar , "Verilog HDL", 2nd Edition, Pearson Education Publication.

4. Michael D. Ciletti , "Advanced Digital Design with Verilog HDL ", PHI Publication.

5. Parag K. Lala, "Digital System Design Using PLDs", PHI India Ltd.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Electrical Engineering

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

<u>EVELUATION SCHEME OF ELECTRICAL ENGINEERING</u>

<u>Third Year</u>

ELECTRICAL ENGG- Semester-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-501	Elements Of Power System	3	1	0	30	20	50	100	150	4
2	NEE 502	Power Electronics	3	1	0	30	20	50	100	150	4
3	NEE-503	Control System	3	1	0	30	20	50	100	150	4
4	NEE-504	Microprocessor & Its Applications	3	1	0	30	20	50	100	150	4
5	NEC-508	Fundamentals of E.M. Theory	2	1	0	15	10	25	50	75	3
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551	Power Electronics Lab	0	0	3	10	10	20	30	50	1
8	NEE 552	Control System Lab	0	0	3	10	10	20	30	50	1
9	NEE-553	Microprocessor Lab	0	0	2	10	10	20	30	50	1
10	NEE 554	Simulation Based Minor Project	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	1
		TOTAL	16	5	10					1000	26

ELECTRICAL ENGG. -Semester-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601	Power System Analysis	3	1	0	30	20	50	100	150	4
2	NEE 602	Switchgear & Protection	3	1	0	30	20	50	100	150	4
3	NEE-603	Special Electric Machine	3	1	0	30	20	50	100	150	4
4	NEE-011 / NEE-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
5	NEE-021 / NEE-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651	Power System Lab	0	0	2	10	10	20	30	50	1
8	NEE-652	Electrical CAD Lab	0	0	3	10	10	20	30	50	1
9	NEE-653	Minor Project	0	0	2	10	10	20	30	50	1
10	NEE 654	Seminar	0	0	3		50	50		50	1
11	NGP 601	GP						50		50	1
		TOTAL	16	5	10					1000	26

Elective-I

NEE – 011: Digital Control System
NEE - 012: Fundamentals of Digital Signal Processing
NEE - 013: Neural Networks and Fuzzy System
NEE - 014: Power Theft and Energy Management

Elective-II

NEE – 021: High Voltage Engineering
NEE -022: Intelligent Instrumentation
NEE -023: Conventional & CAD of Electrical Machines
NEE -024: Smart Energy Delivery Systems

NEE-501: ELEMENTS OF POWER SYSTEM

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Unit-I

Power System Components:
Single line Diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System
Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:
Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.Proximity effect

Unit-II

Over Head Transmission Lines
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

Unit-III

Corona and Interference:
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators:
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

Unit-IV

Mechanical Design of transmission line:
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables:
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit-V

Neutral grounding:
Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line:
Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission:
Introduction to EHV AC and HVDC transmission lines.

Text Books

1.W. D. Stevenson, "Element of Power System Analysis", McGraw Hill,
2.C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3.Asfaq Hussain, "'Power System", CBS Publishers and Distributors,
4.B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5.M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

Reference Books

6.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & sons,
7.S. L. Uppal, "Electric Power", Khanna Publishers
8.S.N.Singh, " Electric Power Generation, Transmission& distribution." PHI Learning

NEE-502:POWER ELECTRONICS

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Unit-I

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics, specifications of switches, types of power electronic circuits,Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT

Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC

Unit-II

Power Semiconductor Devices (Contd.)

Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers and their various applications.

Unit-III

Phase Controlled Converters

Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters. Performance Parameters

Three phase half wave converters, three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls

Single phase ac voltage controller with resistive and inductive loads

Three phase ac voltage controllers (various configurations and comparison only)

Single phase transformer taps changer, industrial applications.

Cyclo Converters

Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation and their applications.

Unit-V

Inverters

Single phase series resonant inverter,Single phase bridge inverters,Three phase bridge inverters

Voltage control of inverters,Harmonics reduction techniques,Single phase and three phase current source inverters

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005
3. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press.

Reference Books:

4. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics &Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008.
7. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

NEE-503: CONTROL SYSTEM

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Unit-I

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit-II

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit-III

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor

Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique:

The root locus concepts, construction of root loci

Unit-IV

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain:

Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles

Unit-V

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:

Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, " Control Systems theory and Applications", Pearson Education

NEE-504: MICROPROCESSORS

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UNIT-I:

Introduction to Digital Computer and Microprocessor:

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II:

8-bit Microprocessors.

8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III:

16-bit Microprocessors: Architecture:

Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes**:** Instruction format:

Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types.

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V

Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter.

8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, “Microcomputers and Microprocessors” PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.

4. Krishna Kant, “Microprocessors and Microcontrollers” PHI Learning.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata Mc Graw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. N. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford University Press.
11. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family” Prentice Hall (India)

NEC-508: FUNDAMENTALS OF E.M.THEORY

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Unit I
Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation, divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density, Energy and potential.

Unit-II
Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations.

Unit-III
Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

Unit-IV
Uniform Plane waves, Plane wave reflection and dispersion

Text Books:

1. Hayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata Mc.Graw Hill Publishing
2. Mathew Sadiku, "Electromagnetic Field Theory", Oxford University Press.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
4. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition.
5. Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition

NEE-551: POWER ELECTRONICS LABORATORY

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Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.
17.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” Prentice hall Inc.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media,

NEE– 552: CONTROL SYSTEM LABORATORY

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Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

10. To simulate PID controller for transportation lag.
11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

NEE-553: MICROPROCESSOR LABORATORY

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A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

EEE-601: POWER SYSTEM ANALYSIS

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Unit-I

Representation of Power System Components:
Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:
Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II

Symmetrical fault analysis:
Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unsymmetrical faults:
Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations

Unit-III Load Flows:
Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations,

load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV

Power System Stability:
Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Unit-V Traveling Waves:
Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

NEE – 602: SWITCHGEAR AND PROTECTION

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<u>Unit I:</u>

Introduction to Protection System:

Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:

Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

<u>Unit-II:</u>

Relay Application and Characteristics:

Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:

Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III

Protection of Transmission Line:

Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

<u>Unit-IV:</u>

Circuit Breaking:

Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:

Classification, testing station and equipments, testing procedure, direct and indirect testing

<u>Unit-V</u>

Apparatus Protection:

Protection of Transformer, generator and motor.

Circuit Breaker:

Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, "Switchgear and Protection", Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, "Fundamentals of Power System Protection", Prentice Hall of India.
5. T.S.M Rao,"Power System Protection: Static Relays with Microprocessor Applications" Tata Macgraw Hill".
6. A.R. Van C. Warringtaon , " Protective Relays- Their Theory and Practice, Vol. I & II" Jhon Willey & Sons.

NEE-603: SPECIAL ELECTRICAL MACHINES

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UNIT-I

Poly-phase AC Machines:
Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power)

UNIT-II

Single phase Induction Motors:
Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor-start capacitor-run and shaded pole motors.

Two Phase AC Servomotors:
Construction, torque-speed characteristics, performance and applications.

UNIT-III Stepper Motors:
Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:
Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT-IV

Permanent Magnet Machines:
Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V

Single Phase Commutator Motors:
Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra “Generalized Theory of Electrical Machines” Khanna Publishers.
2. P.C. Sen “ Principles of Electrical Machines and Power Electronics” John willey & Sons, 2001
3. G.K.Dubey “Fundamentals of Electric Drives” Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott “Fractional and Sub-fractional horse power electric motors” McGraw Hill International, 1987
5. M.G. Say “ Alternating current Machines” Pitman & Sons .

DEPARTMENTAL ELECTIVES

ELECTIVE – I

NEE – 011: Digital Control System

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3 1 0

UNIT-I

Signal Processing in Digital Control:

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample- hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II

Design of Digital Control Algorithms:

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

UNIT-III

State Space Analysis and Design:

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

UNIT-IV

Stability of Discrete System:

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

UNIT-V

Optimal digital control :

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System",Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems:Theory, hardware, Software",Mc Graw Hill.

NEE - 012: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

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3 1 0

<u>Unit-I</u>

Discrete-Time Signals And Systems:
Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Discrete Fourier Transform:
Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit-II

Sampling of Continuous Time Signals:
Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

<u>Unit-III</u>

Transform Analysis of LTI Systems:
Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase
Overview of finite precision numerical effects, effects of coefficient quantization,Effects of round-off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

<u>Unit-IV</u>

Filter Design Techniques:
Design of D-T IIR filters from continuous – time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation

<u>Unit-V</u>

Efficient computation of the DFT:
Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier Analysis of Signals Using DFT :
DFT analysis of sinusoidal signals, time-dependent Fourier transforms: Block convolution, Fourier analysis of non – stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. & Manolakis, D.G.,” Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall of India.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, Prentice Hall of India.
5. Oppenheim, Alan V. & Willsky, Alan S. , “Signals and Systems” , Prentice Hall of India, 2nd Edition
6. Johnson, J.R. , “Introduction to Digital Signal Processing”, Prentice Hall of India.

NEE - 013: NEURAL NETWORKS AND FUZZY SYSTEM

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Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule,
Auto-associative and hetro-associative memory

Unit-II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.

Reference Books:

3. Siman Haykin, “Neural Netowrks” Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

NEE - 014: POWER THEFT AND ENERGY MANAGEMENT

L T P

3 1 0

UNIT-I

Introduction: Energy sources, Energy demand and supply, Energy crisis, Future scenario,

Menace of power theft, reasons for power pilferage, electricity loss and theft-National and Global scenario, Security seals and tampering, harmonics and power theft, Control Over power theft.

UNIT-II

Power Theft in Electro-mechanical Meters: Power theft in Voltage circuit, by-passing meters, drilling holes on Electro-mechanical Meters, Insertion of film into meter, partial earth fault tampering, Missing Neutral Method.

Power Theft in Electronic Meters:

Power theft by means of Electrostatic Discharge, by tampering printed circuit board, by tampering the frequency circuit, tampering on display circuits of energy meter, Introducing limit switch.

UNIT-III

Energy system efficiency, Energy conservation aspects, Instrumentation and measurements.

Principles of Energy Management and Energy Audit: General principles, Planning and program, Introduction to energy audit, General methodology, Site surveys, Energy systems survey, Energy audit, Instrumentation, Analysis of data and results.

UNIT-IV

Electrical Load and Lighting Management: General principles, Illumination and human comfort, Lighting systems, Equipment's, Electrical systems, Electrical load analysis, Peak load controls.

Demand Side Management: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM

Text Books:

1. G.Sreenivasan, “Power Theft”, PHI Learning Private Limited
2. Amlan Chakrabarti, “Energy Engineering and Management ”, PHI Learning Private Limited
3. W R Murphy, G Mckay, ‘Energy Management’ B.S. Publications.

DEPARTMENTAL ELECTIVES
ELECTIVE – II

NEE – 021: HIGH VOLTAGE ENGINEERING

L T P
2 1 0

UNIT-I

Break Down In Gases:

Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics:

Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectrics:

Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT-II

Generation of High Voltages and Currents:

Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of High Voltages and Currents:

Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

UNIT-IV

Non-Destructive Testing:

Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:

Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, McGraw Hill Education (India) Private Limited.

Reference Books:

2. E. Kuffel and W. S. Zacngal, High Voltage Engineering", Pergamon Press.
3. R. S. Jha, "High Voltage Engineering", Dhanpat Rai & sons
4. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.
5. M. Khalifa,' High Voltage Engineering Theory and Practice,' Marcel Dekker.
6. Subir Ray,' An Introduction to High Voltage Engineering' Prentice Hall of India

NEE -022: INTELLIGENT INSTRUMENTATION

L T P
2 1 0

Unit – 1& 2

1. **Introduction: Introduction to Intelligent Instrumentation:**
   Historical Perspective, current status, software based instruments.
2. **Virtual Instrumentation:**
   Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

Unit-3

3. Data Acquisition Methods: Analog and Digital IO, Counters, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls.

Unit-4

4. PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing - RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI.

References:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall.
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall.
3. H. S. kalsi, "Electronic Instrumentation", McGraw Hill Education (India) Private Limited.
4. S. Gupta , J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED./ Instrument Society of America, 1994.
5. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill.

NEE -023: CONVENTIONAL & CAD OF ELECTRICAL MACHINES

L T P
2 1 0

UNIT-I

Basic Considerations:
Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials.
Calculation of total mmf and magnetizing current. Transformer Design:
Output equation design of core, yoke and windings, overall dimensions,
Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT-II
Design of rotating machines – I:
Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size.
Core and armature design of dc and 3-phase ac machines

UNIT-III
Design of rotating machines – II:
Rotor design of three phase induction motors.
Design of field system of DC machine and synchronous machines. Estimation of performance from design data.

UNIT-IV
Computer Aided Design
Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure.
Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.

Text Books:
1. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay," Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.

Reference Books:
3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C.Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

NEE -024: SMART ENERGY DELIVERY SYSTEMS

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2 1 0

UNIT I
Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.
UNIT II
Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.
UNIT III
Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).
UNIT IV
Microgrids and Distributed Energy Resources: Concept of microgrid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources.

Text Books:
1. Ali Keyhani, Mohammad N. Marwali, Min Dai “Integration of Green and Renewable Energy in Electric Power Systems”, Wiley
2. Clark W. Gellings, “The Smart Grid: Enabling Energy Efficiency and Demand Response”, CRC Press
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley
4. Jean Claude Sabonnadière, Nouredine Hadjsaïd, “Smart Grids”, Wiley Blackwell 19
5. Stuart Borlase, “Smart Grids (Power Engineering)”, CRC Press
Reference Books:
1. Andres Carvallo, John Cooper, “The Advanced Smart Grid: Edge Power Driving Sustainability: ”, Artech House Publishers July 2011
2. James Northcote, Green, Robert G. Wilson “Control and Automation of Electric Power Distribution Systems (Power Engineering)”, CRC Press
3. Mladen Kezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert “Substation Automation (Power Electronics and Power Systems)”, Springer
4. R. C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, “Electrical Power System Quality”, 2nd Edition, McGraw Hill Publication

NEE – 651: POWER SYSTEM LAB

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1

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (x_d) and quadrature axis reactance (x_q) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (x_d) and sub transient quadrature axis reactance (x_q) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata Mc.Graw Hill.
2. T. K. Nagsarskar & M.S. Sukhija,’ Power System Analysis’ Oxford Universitry Press.

NEE=652: ELECTRICAL CAD LAB

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1. Design of Single phase transformer.
2. Design of Three phase transformer.
3. Design of Single phase Induction Motor.
4. Design of Three phases Induction Motor.
5. Design of DC motor.
6. Design of DC generator.
7. Design of Single phase alternator.
8. Design of three phase alternator.
9. Design of Synchronous Motor.
10. Design of lag, lead and lag-lead compensator.

Text Books:-

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
3. D.P. Kothari & I J Nagrath, "Electric Machine", McGraw Hill Education (India) Private Limited, Sigma Series.
4. S.K. Bhattacharya, "Electrical Machine", McGraw Hill Education (India) Private Limited.
5. Bhag S, Guru and Huseyin R.Hiziroglu, " Electric machinery and Transformers", Oxford University Press.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Computer Science & Engineering
&
Bachelor of Computer Science & Information Technology

3rd Year (V & VI Semester)

(Effective from Session: 2015-2016)

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –V

(Effective from the session: 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 501	Design and Analysis of Algorithm	3	1	0	30	20	50	100	150	4
2	NCS 502	Database Management System	3	1	0	30	20	50	100	150	4
3	NCS 503	Principle of Programming Language	3	1	0	30	20	50	100	150	4
4	NCS 504	Web Technology	3	1	0	30	20	50	100	150	4
5	NCS 505	Computer Architecture	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NCS 551	Design and Analysis of Algorithm Lab	0	0	3	10	10	20	30	50	1
8	NCS 552	DBMS Lab	0	0	3	10	10	20	30	50	1
9	NCS 553	Principle of Programming Language	0	0	2	10	10	20	30	50	1
10	NCS 554	Web Technology Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	10					1000	25

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING
&
B. TECH. COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

YEAR THIRD, SEMESTER –VI

(Effective from the session : 2015-16)

S. No.	Course Code	Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NCS 601	Computer Networks	3	1	0	30	20	50	100	150	4
2	NCS 602	Software Engineering	3	1	0	30	20	50	100	150	4
3	NCS 603	Compiler Design	3	1	0	30	20	50	100	150	4
4		Departmental Elective-I	3	1	0	30	20	50	100	150	4
5		Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
	PRACTICAL/DESIGN/DRAWING										
7	NCS 651	Computer Networks Lab	0	0	3	10	10	20	30	50	1
8	NCS 652	Software Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCS 653	Compiler Design Lab	0	0	2	10	10	20	30	50	1
10	NCS 654	SEMINAR	0	0	2		50	50		50	1
11	NGP 601	GP						50		50	
		TOTAL	16	5	10					1000	25

Departmental Elective-I

1. NCS 061: Computational Geometry
2. NCS 062: Complexity Theory
3. NCS 063: Parallel Algorithm
4. NCS 064: Approximation & Randomized Algorithm
5. NCS 065: Concurrent System

Departmental Elective-II

1. NCS 066: Data Warehousing & Data Mining
2. NCS 067: Distributed Database
3. NCS 068: E-Commerce
4. NCS 069: Advance DBMS
5. NCS 070: Human Computer Interface

NCS- 501 Design and Analysis of Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction** : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.	8
II.	**Advanced Data Structures***:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.	8
III.	**Divide and Conquer** with examples such as Sorting, Matrix Multiplication, Convex hull and Searching. **Greedy methods** with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.	8
IV.	**Dynamic programming** with examples such as Knapsack. All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem. Backtracking, Branch and Bound with examples such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.	8
V.	Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.	8

Text books:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

References:

1. Jon Kleinberg and Éva Tardos, *Algorithm Design*, Pearson, 2005.
2. Michael T Goodrich and Roberto Tamassia, *Algorithm Design: Foundations, Analysis, and Internet Examples*, Second Edition, Wiley, 2006.
3. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
4. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
5. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
6. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

NCS-502 Database Management System		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** An overview of database management system, database system Vs file system, Database system concept and architecture, data model schema and instances, data independence and database language and interfaces, data definitions language, DML, Overall Database Structure. **Data Modeling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationship of higher degree.	8
II.	**Relational data Model and Language:** Relational data model concepts, integrity constraints, entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction on SQL:** Characteristics of SQL, advantage of SQL. SQl data type and literals. Types of SQL commands. SQL operators and their procedure. Tables, views and indexes. Queries and sub queries. Aggregate functions. Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	8
III.	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.	8
IV.	**Transaction Processing Concept:** Transaction system, Testing of serializability, serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling. **Distributed Database:** distributed data storage, concurrency control, directory system.	8
V.	**Concurrency Control Techniques:** Concurrency control, Locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi version schemes, Recovery with concurrent transaction, case study of Oracle.	8

Text books:

1.Korth, Silbertz, Sudarshan," Database Concepts", McGraw Hill 2.Date C J, " An Introduction to Database Systems", Addision Wesley

3. Elmasri, Navathe, " Fudamentals of Database Systems", Addision Wesley

4. O'Neil, Databases, Elsevier Pub.

References:

1.Leon & Leon,"Database Management Systems", Vikas Publishing House 2.Bipin C. Desai, " An Introduction to Database Systems", Gagotia Publications 3. Majumdar & Bhattacharya, "Database Management System", TMH

NCS- 503 Principle of Programming Language		3 1 0
Unit	Topic	Proposed Lectures
I.	Introduction The Role of Programming Languages: Why Study Programming Languages, Towards Higher-Level languages, Programming paradigms, Programming environments Language Description: Syntactic structure, language Translation Issues: Programming language Syntax, Stages in translation, Formal translation Models	8
II.	Language Properties Modeling Language Properties, Elementary Data Types, Encapsulation, Inheritance, Sequence Control, Subprogram Control	8
III.	Programming Paradigms Imperative Programming: Statements, Types, Procedure Activations Object-Oriented Programming: Grouping Of Data and Operations, object oriented programming Functional Programming: Elements, Programming in a Typed language, Programming with lists	8
IV.	Other Programming Paradigms Logic Programming, Concurrent Programming, Network Programming , Language Description: Semantic Methods	8
V.	Lambda Calculus Introduction to Lambda Calculus, Simple types, Subtyping	8

Text books:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal,Fourth ed.,Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England

References:

1. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

NCS- 504 Web Technology		3 1 0
Unit	Topic	Proposed Lectures
I.	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. **Core Java:** Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers.	8
II.	**Web Page Designing:** HTML: list, table, images, frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML.	8
III.	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, VB Script, Introduction to Java Beans, Advantage, Properties, BDK, Introduction to EJB, Java Beans API.	8
IV.	**Server Site Programming:** Introduction to active server pages (ASP), Introduction to Java Server Page (JSP), JSP Application Design, JSP objects, Conditional Processing, Declaring variables and methods, Sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP, Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages, Introduction to COM/DCOM/CORBA.	8
V.	**PHP (Hypertext Preprocessor):** Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form, mail, file upload, session, error, exception, filter, PHP-ODBC,	8

Text books:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Bhave, “Programming with Java”, Pearson Education
5. Herbert Schieldt, “The Complete Reference:Java”, TMH. 6. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
6. Ullman, “PHP for the Web: Visual QuickStart Guide”, Pearson Education
7. Margaret Levine Young, “The Complete Reference Internet”, TMH
8. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
9. Balagurusamy E, “Programming in JAVA”, TMH

References:

1. Ramesh Bangia, “Internet and Web Design” , New Age International
2. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
3. Deitel, “Java for programmers”, Pearson Education
4. Chris Bates, “Web Programing Building Internet Applications”, 2nd Edition, WILEY, Dreamtech
5. Joel Sklar , “Principal of web Design” Vikash and Thomas Learning
6. Horstmann, “CoreJava”, Addison Wesley

NCS- 505 Computer Architecture		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction**:. Digital computer generation, computer types and classifications, functional units and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. **Central Processing Unit:** Addition and subtraction of signed numbers, look ahead carry adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation Processor organization, general register organization, stack organization and addressing modes.	8
II	**Control Unit:** Instruction types, formats, instruction cycles and subcycles (fetch and execute etc) , micro-operations, execution of a complete instruction. Hardwire and microprogrammed control: microprogramme sequencing, wide branch addressing, microinstruction with next address field, pre-fetching microinstructions, concept of horizontal and vertical microprogramming.	8
III	**Memory:** Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues 9 performance, address mapping and replacement) Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	8
IV	**Input / Output:** Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	8

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Sixth Edition, Pearson Education, 2003.

REFRENCE BOOKS:-

1. Patterson, Computer Organisation and Design, Elsevier Pub. 2009
2. Vravice,Hamacher & Zaky, “Computer Organization”, TMH
3. Mano,” Computer System Architecture”, PHI
4. John P Hays, “ Computer Organization”, McGraw Hill
5. Tannenbaum,” Structured Computer Organization’, PHI 6.

P Pal chaudhry, ‘ Computer Organization & Design’, PHI

NCS 551 Design and analysis of algorithms Lab

Objective :-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Study of NP-Complete theory.
8. Study of Cook's theorem.
9. Study of Sorting network.

NCS 552 DBMS Lab

Objectives:-

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL: a)Writing basic SQL SELECT statements. b)Restricting and sorting data. c)Displaying data from multiple tables. d)Aggregating data using group function. e)Manipulating data. e)Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

NCS 553 Principles of programming languages

1. Define a LISP function to compute sum of squares.
2. Define a LISP function to compute difference of squares. (if x > y return $x^2 - y^2$, otherwise $y^2 - x^2$)
3. Define a Recursive LISP function to solve Ackermann's Function.
4. Define a Recursive LISP function to compute factorial of a given number.
5. Define a Recursive LISP function which takes one argument as a list and returns last element of the list. (do not use last predicate)
6. Define a Recursive LISP function which takes one argument as a list and returns a list except last element of the list. (do not use but last predicate)
7. Define a Recursive LISP function which takes one argument as a list and returns reverse of the list. (do not use reverse predicate)
8. Define a Recursive LISP function which takes two arguments first, an atom, second, a list, returns a list after removing first occurrence of that atom within the list.

NCS 554 Web Technology Lab

Objectives:-

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Design HTML form for keeping student record and validate it using Java script.
3. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
4. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Using ASP for server side programming, ASP for user name and password and to retrieve & match the value. It display success and failure messages. ASP for creating text file local drive, ASP for keeping the student record in database.
8. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
9. Design and implement a simple shopping cart example with session tracking API.

NCS-601 Computer Networks		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.	8
II	Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	8
III	Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	8
IV	Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	8
V	Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.	8

TEXTBOOKS:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press

REFRENCES:

1. Anuranjan Misra, “Computer Networks”, Acme Learning
2. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

NCS- 602 Software Engineering		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction:**Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	8
II	**Software Requirement Specifications (SRS)** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality Assurance (SQA):** Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.	8
III	**Software Design:**Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8
IV	**Software Testing:**Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.	8
V	**Software Maintenance and Software Project Management** Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.	8

Textbooks:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley

5.Deepak Jain,"Software Engineering:Principles and Practices",Oxford University Press.

NCS-603 Compiler Design		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	8
II	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	8
III	Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	8
IV	Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

Refrences:

1.K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2.J.P. Bennet, "Introduction to Compiler Techniques", Second Edition, Tata McGraw-Hill,2003.
3.Henk Alblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

DEPARTMENTAL ELECTIVE-I

NCS-061 Computational Geometry		3 1 0
Unit	Topic	Proposed Lectures
I	Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs.	8
II	Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties	8
III	Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems	8
IV	Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham- sandwich cuts.	8
V	Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	8

Textbooks:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

NCS-062 Complexity Theory		3 1 0
Unit	Topic	Proposed Lectures
I	Models of Computation, resources (time and space), algorithms, computability, complexity.	8
II	Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.	8
III	Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.	8
IV	Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.	8
V	Probabilistically checkable proofs; Communication complexity; Quantum computation	8

Textbooks:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

NCS-063 Parallel Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.	8
II	Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost-optimal algorithms- such as summation, Min/Max on various models.	8
III	Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array.	8
IV	Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.	8
V	Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.	8

Textbooks:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill. 2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

NCS-064 Approximation and Randomized Algorithms		3 1 0
Unit	Topic	Proposed Lectures
I	Introduction to probability and randomized algorithms. Examples of randomized algorithms . Basic inequalities, Random variables.	8
II	Max-cut and derandomization. Permutation routing in a hypercube. Basic Chernoff bound. Markov chains and random walks (2-SAT example, random walk on a path example). Cover times. Universal traversal sequences.	8
III	Generation of combinatorial arrays. Random constructions and derandomized algorithms.	8
IV	Introduction to Approximation Algorithms, Set cover, TSP ,Knapsack, bin packing, Euclidean TSP	8
V	LP duality introduction; set cover randomized rounding, Set cover via primal - dual , k-median on a cycle, Max-Sat, Multiway cut, Steiner forest, Group Steiner trees	8

References:

1. Rajeev Motwani and Prabhakar Raghavan. Randomized Algorithms. Cambridge University Press, Cambridge, England, June 1995.
2. Michael Mitzenmacher and Eli Upfal. Probability and Computing. Cambridge University Press, 1st edition, 2005.
3. Sheldon M. Ross. Probability Models. Academic Press, Inc., 7th edition, 2000 4. V. Vazirani, Approximation Algorithms, Springer, 2001.

NCS-065 Concurrent Systems		3 1 0
Unit	Topic	Proposed Lectures
I	**Introduction to concurrent systems and Formal Methods:** Reactive systems, Formal methods for reactive systems, Labelled transition systems, Operational semantics for concurrent processes.	8
II	**Process Algebras**: Operators for process modelling, CCS, CSP, Pi-calculus	8
III	Asynchronous Pi Calculus	8
IV	Distributed Pi Calculus, Introduction to type systems	8
V	**Tools and Techniques:** Experimental practice on mobility workbench (MBW), concurrency workbench (CWB-NC), CTMC.	8

References:

1. Robin Milner: Communicating and mobile systems: The π-Calculus,Cambridge University Press, 1999
2. Matthew Hennessy: A distributed Pi-Calculus, Cambridge University Press, 2007
3. Davide Sangiorgi and David Walker: The π -Calculus: A theory of Mobile Processes, Cambridge , University Press, 2001
4. Manuals of MBW, CWB-NC,CTMC.

DEPARTMENTAL ELECTIVE-II

NCS-066 Data warehousing & Data Mining		2 1 0
Unit	Topic	Proposed Lectures
I	Data Warehousing: Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.	8
II	Data Warehouse Process and Technology: Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design, Data Extraction, Cleanup & Transformation Tools, Warehouse Metadata	8
III	Data Mining: Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	8
IV	Classification: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method –Statistical Approach, Association rules: Introduction, Large Itemsets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	8
	Data Visualization and Overall Perspective: Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining.	8

Textbooks:

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, " Data Warehousing: Architecture and Implementation", Pearson
3. Margaret H. Dunham, S. Sridhar,"Data Mining:Introductory and Advanced Topics" Pearson Education
4. Arun K. Pujari, "Data Mining Techniques" Universities Press
5. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education

NCS-067 Distributed Database		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler.	8
III	Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques.	8

TextBooks:

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education .

Refrences:

1.Ceei and Pelagatti,'Distributed Database', TMH

2.Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-068 E-Commerce		2 1 0
Unit	Topic	Proposed Lectures
I	Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.	8
II	Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY). Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.	8
III	Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.	8
IV	Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.	8
V	Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking. EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.	

Text Books:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison-Wesley.

2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International 3. Goel, Ritendra “E-commerce”, New Age International

4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education

5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH

6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

NCS-069 Advanced DBMS		2 1 0
Unit	Topic	Proposed Lectures
I	Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.	8
II	Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler	8
III	Distributed Transactions Management, Data Distribution,fragmentation and Replication Techniques,Distributed Commit, Distributed Locking schemes, Long duration transactions,Moss Concurrency protocol.	8
IV	Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems,Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.	8
V	Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques	8

Text Books:

1. Silberschatz, Korth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill

References:

1. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education 2. Ceei and Pelagatti,'Distributed Database', TMH
3. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

NCS-070 Human Computer Interaction		2 1 0
Unit	Topic	Proposed Lectures
I	**Introduction** : Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	8
II	**Design process** – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	8
III	**Screen Designing** : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	8
IV	**Windows** – New and Navigation schemes selection of window, selection of devices based and screen based controls. **Components** – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	8
V	**Software tools** – Specification methods, interface – Building Tools. **Interaction Devices** – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.	8

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale Human Computer Interaction, 3rd Edition Prentice Hall, 2004.
2. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, Research Methods in HumanComputer Interaction, Wiley, 2010.

REFERENCE:

1. Ben Shneiderman and Catherine Plaisant Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th Edition, pp. 672, ISBN 0-321-53735-1, March 2009), Reading, MA: Addison-Wesley Publishing Co.

NCS 651 Computer Networks Lab

1. Programs using TCP Sockets (like date and time server & client, echo server & client, etc.)
2. Programs using UDP Sockets (like simple DNS)
3. Programs using Raw sockets (like packet capturing and filtering)
4. Programs using RPC
5. Simulation of sliding window protocols

NCS 652 Software Engineering Lab

For any given case/ problem statement do the following;

1. Prepare a SRS document in line with the IEEE recommended standards.
2. Draw the use case diagram and specify the role of each of the actors. Also state the precondition, post condition and function of each use case.
3. Draw the activity diagram.
4. Identify the classes. Classify them as weak and strong classes and draw the class diagram.
5. Draw the sequence diagram for any two scenarios.
6. Draw the collaboration diagram.
7. Draw the state chart diagram.
8. Draw the component diagram.
9. Perform forward engineering in java.(Model to code conversion)
10. Perform reverse engineering in java.(Code to Model conversion)
11. Draw the deployment diagram.

NCS 653 Compiler Design Lab

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY

UTTAR PRADESH, LUCKNOW

Syllabus

3rd Year

[Effective from Session 2016-17]

1. **B.Tech. Electronics Engineering**
2. **B.Tech. Electronics & Communication Engineering**
3. **B.Tech. Electronics & Telecommunication Engineering**

SEMESTER-V

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 501R	Integrated Circuits	3	1	0	30	20	50	100	150	4
2	NEC 502	Principles of Communication	3	1	0	30	20	50	100	150	4
3	NEC 503	Microprocessors	3	1	0	30	20	50	100	150	4
4	NIC 501	Control System -I	3	1	0	30	20	50	100	150	4
5	NEC 504	Antenna and Wave Propagation	2	1	0	15	10	25	50	75	3
6	NHU501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 551R	Integrated Circuits Lab	0	0	2	10	10	20	30	50	1
8	NIC 551	Control System Lab	0	0	2	10	10	20	30	50	1
9	NEC 552	Communication Lab - 1	0	0	2	10	10	20	30	50	1
10	NEC 553	Microprocessors Lab	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	
		TOTAL	16	5	8					1000	25

CT Class Test **AT** Attendance **TA** Tutorial Assignment
ESE End Semester Examination
L/T/P Lecture/ Tutorial/ Practical

SEMESTER-VI

No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECTS											
1	NEC 601	Microwave Engineering	3	1	0	30	20	50	100	150	4
2	NEC 602	Digital Communication	3	1	0	30	20	50	100	150	4
3	NEC 603	Integrated Circuit Technology	3	1	0	30	20	50	100	150	4
4	NEC0_	Departmental Elective -I	3	1	0	30	20	50	100	150	4
5	NEC0_	Departmental Elective - II	2	1	0	15	10	25	50	75	3
6	NHU601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/ DESIGN/ DRAWING											
7	NEC 651	Antenna and Microwave Lab	0	0	2	10	10	20	30	50	1
8	NEC 652	Communication Lab - II	0	0	2	10	10	20	30	50	1
9	NEC 653	CAD of Electronics Lab	0	0	2	10	10	20	30	50	1
10	NEC 654R	Seminar	0	0	1	10	10	20	-	20	1
11	NEC 655	Microcontrollers for Embedded Systems Lab	0	0	1	6	6	12	18	30	1
12	NGP 601	GP						50		50	
		TOTAL	16	5	8					1000	26

Departmental Elective –I

1. NEC011 Digital Signal Processing
2. NEC 012 Computer Architecture and Organization
3. NEC 013 Artificial Neural Network
4. NEC 014 Advance Semiconductor Devices
5. NEC013R Real Time Systems

Departmental Elective - II

1. NEC 021 Industrial Electronics
2. NEC 022R Microcontroller for Embedded Systems
3. NEC 023 Analog Signal Processing
4. NEC 024R Advance Digital Design using Verilog

NEC 501R Integrated Circuits		
Unit	Topic	Number of Lectures
I	**Analog Integrated circuit Design: an overview:** Current Mirrors using BJT and MOSFETs, Simple current Mirror, Base current compensated current Mirror, Wilson and Improved Wilson Current Mirrors, Widlar Current source and Cascode current Mirror **The 741 IC Op-Amp:** Bias circuit, short circuit protection circuitry, the input stage, the second stage, the output stage, and device parameters; DC Analysis of 741: Small Signal Analysis of input stage, the second stage, the output stage; Gain, Frequency Response of 741; a Simplified Model, Slew Rate, Relationship Between ft and SR	10
II	**Linear Applications of IC op-amps:** An Overview of Op-Amp (ideal and non-ideal) based Circuits V-I and I-V converters, generalized Impedance converter, simulation of inductors **Filters:** First and second order LP, HP, BP BS and All pass active filters, KHN.	8
III	**Digital Integrated Circuit Design-An Overview**: CMOS Logic Gate Circuits**:** Basic Structure CMOS realization of Inverters, AND, OR, NAND and NOR Gates **Latches and Flip flops:** The Latch, The SR Flip-flop, CMOS Implementation of SR Flip- flops, A Simpler CMOS Implementation of the Clocked SR Flip-flop, D Flip-flop Circuits.	8
IV	**Non-Linear applications of IC Op-amps:** Log–Anti Log Amplifiers, Precision Rectifiers, Peak Detectors, Simple and Hold Circuits, Analog Multipliers and their applications. Op- amp as a comparator, Zero crossing detector, Schmitt Trigger, Astable multi vibrator, Mono stable multi vibrator, Generation of Triangular Waveforms	7
V	**D/A and A/D converters** **Integrated Circuit Timer:** The 555 Circuit, Implementing a Monostable Multivibrator Using the 555 IC, Astable Multi vibrator Using the 555 IC. **Phase locked loops (PLL):** Ex-OR Gates and multipliers as phase detectors, Block Diagram of IC PLL, Working of PLL and Applications of PLL.	7

Text Books:

1. Sedra and Smith, “Microelectronic Circuits”, 6thEdition, Oxford University Press.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 2nd Edition.

Reference Books:

1. Jacob Millman and Arvin Grabel, “Microelectronics”, 2nd Edition, Tata McGraw Hill.
2. Behzad Razavi, “Fundamentals of Microelectronics”, 2nd Edition, Wiley.
3. Mark N. Horenstein, “Microelectronic Circuits and Devices”, PHI.
4. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis and Robert G. Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley.
5. Data Sheet: http://www.ti.com/lit/ds/symlink/tl082.pdf

6. Application Note: http://www.ti.com/lit/an/sloa020a/sloa020a.pdf
7. MPY634 Data Sheet: http://www.ti.com/lit/ds/symlink/mpy634.pdf
8. Application Note: http://www.ti.com/lit/an/sbfa006/sbfa006.pdf
9. ASLK Pro Manual: ASLK Manual

NEC 502 Principles of Communication		
Unit	**Topic**	**Lectures**
I	Introduction:OverviewofCommunicationsystem,Communicationchannels,Nedformodulation,Baseband and Pass band signals, Amplitude Modulation: Double side bandwidth Carrier(DSB-C),Double side band without Carrier, Single Side Band Modulation, DSB-SC,DSB-C,SSB Modulators and Demodulators, Vestigial Side Band (VSB),Quadrature Amplitude Modulator, Radio Transmitter and Receiver.	10
II	Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	8
III	Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM),PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy.	8
IV	Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.	7
V	Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-Emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops: Analog and Digital.	7

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill Publication.

Reference Books:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.Hsu &D.Mitra,"Analog and Digital Communications", Tata McGraw-Hill Publication.

NEC 503 MICROPROCESSORS		
Unit	**Topic**	**Lectures**
1.	Evolution of microprocessors, Microprocessor architecture and its operations, 8085 pins description, programming model, basic interfacing concepts, input and output devices, logic devices and memory interfacing, addressing modes, Concept of instruction cycle, machine cycle and T-states, Concept of interrupts, Classification of 8085 instructions.	**8**
2.	8086 architecture-functional diagram, register organization, memory segmentation, programming model, memory address, physical memory organization, pins description, clock generator 8284A, maximum mode and minimum mode signal descriptions, timing diagrams, introduction to DOS and BIOS interrupts.	**8**
3.	Instruction formats, addressing modes, classification of instruction set, assembler directives (debug, TASM & MASM), macros, Programs techniques and assembly language programs: simple programs involves data transfer operation, arithmetic operation, logical operation, branch operation, machine control operation, string manipulations, stack and subroutine operations.	**8**
4.	8255 Programmable peripheral interfacing various mode of operation to 8086, interfacing keyboard and seven segment display, stepper motor interfacing, D/A and A/D converter, 8254 (8253) programmable interval timer, Direct Memory Access and 8237 DMA controller.	**8**
5.	Memory interfacing to 8086. Interrupt structure of 8086, interrupt handling, vector interrupt table and interrupt Service routine. Interfacing interrupts controller 8259 and DMA Controller 8257 to 8086. Serial communication standards, Serial data transfer schemes.	**8**

Text Book:

1. Ramesh Gaonkar, "Microprocessor architecture, programming and applications with the 8085",Penram International Publication (India) Pvt. Ltd.
2. Douglas V. Hall, "Microprocessors and Interfacing", Tata McGraw Hill Publication.

Reference Books:

1. Sivarama P. Dandamudi, "Introduction to Assembly Language Programing From 8086 to Pentium Processors", Springer Publication.
2. Walter A. Triebel and Avtar Singh, "The 8088 and 8086 Microprocessors: Programming, Interfacing Software, Hardware and Applications", Pearson Publication.
3. A. K. Ray and K. M. Bhurchandi, "Advance microprocessors and Peripherals" Tata McGraw Hill Publication.
4. Lyla B. Das, "The X86 Microprocessors, Architecture, Programming and Interfacing (8086 to Pentium)", Pearson Publication.

NIC 501 Control System -I		
Unit	**Topic**	**Lectures**
I	Basic Components of a control system, Feedback and its effect, types of feedback control systems. Block diagrams Reduction and signal flow graphs, Modeling of Physical systems: electrical networks, mechanical systems elements, equations of mechanical systems, sensors and encoders in control systems, DC motors in control systems.	8
II	State-Variable Analysis: Vector matrix representation of state equation, state transition matrix, state-transition equation, relationship between state equations and high-order differential equations, relationship between state equations and transfer functions. Similarity Transformation, Decomposition of transfer functions, Controllability and observability.	8
in	Time domain Analysis of Control Systems: Time response of continuous data systems, typical test signals for the time response of control systems, the unit step response and time-domain specifications, Steady-State error, time response of a first order system, transient response of a prototype second order system.	8
IV	Stability of Linear Control Systems: Bounded-input bounded-output stability continuous data systems, zero-input and asymptotic stability of continuous data systems, methods of determining stability, Routh Hurwitz criterion. Root-Locus Technique: Introduction, Properties of the Root Loci, Design aspects of the Root Loci	8
V	Frequency Domain Analysis: M_r (resonant peak) and ω_r (resonant frequency) and bandwidth of the prototype Second order system, effects of adding a zero to the forward path, effects of adding a pole to the forward path, Nyquist stability criterion, relative stability: gain margin and phase margin, stability analysis with The Bode plot.	8

Text Book:

1. B.C. Kuo & Farid Golnaraghi, "Automatic Control Systems", John Wiley India Publication.

Reference Books:

1. William A. Wolovich, "Automatic Control Systems", Oxford University Press.
2. Joseph J. Distefano III, Allen R. Stubberud, Ivan J. Williams, "Feedback and Control Systems" Schaums Outlines Series, Tata McGraw Hill Publication.
3. I. J. Nagrath & M. Gopal, "Control System Engineering", New Age International Publishers.

NEC 504 Antenna and Wave Propagation		
Unit	**Topic**	**Lectures**
I	**Antennas Basics:** Introduction, Basic Antenna Parameters, Patterns, Beam Area (or Beam Solid Angle) QA, Radiation Intensity, Beam Efficiency, Directivity D and Gain G, Directivity and Resolution, Antenna Apertures, Effective Height, The radio Communication link, Fields from Oscillating Dipole, Single-to-Noise Ratio(SNR), Antenna Temperature, Antenna Impedance.	**8**
II	**Point Sources and Their Arrays:** Introduction, Point Source, Power Theorem and its Application to an Isotropic Source, Radiation Intensity, Arrays of Two Isotropic Point Sources, Non-isotropic but Similar Point Sources and the Principle of Pattern Multiplication, Pattern Synthesis by Pattern Multiplication, Linear Arrays of n Isotropic Point Sources of Equal Amplitude and Spacing, Linear Broadside Arrays with Non- uniform Amplitude Distributions. General Considerations. **Electric Dipoles, Thin Liner Antennas and Arrays of Dipoles and Apertures:** The Short Electric Dipole, The Fields of a Short Dipole, Radiation Resistance of Short Electric Dipole, Thin Linear Antenna, Radiation Resistance of $\lambda/2$ Antenna, Array of Two Driven $\lambda/2$ Elements: Broadside Case and End-Fire Case, Horizontal Antennas Above a Plane Ground, Vertical Antennas Above a Plane Ground, Yagi-Uda Antenna Design, Long-Wire Antennas, folded Dipole Antennas.	**8**
III	**The Loop Antenna:** Design and its Characteristic Properties, Application of Loop Antennas, Far Field Patterns of Circular Loop Antennas with Uniform Current, Slot Antennas, Horn Antennas, Helical Antennas, The Log-Periodic Antenna, Micro strip Antennas. **Reflector Antennas:** Flat Sheet Reflectors, Corner Reflectors, The Parabola-General Properties, A Comparison Between Parabolic and Corner Reflectors, The Paraboloidal Reflector, Patterns of Large Circular Apertures with Uniform Illumination, Reflector Types (summarized), Feed Methods for Parabolic Reflectors.	**8**
IV	**Ground Wave Propagation: Plane** Earth Reflection, Space Wave and Surface Wave. **Space Wave Propagation: Introduction,** Field Strength Relation, Effects of Imperfect Earth, Effects of Curvature of Earth. **Sky wave Propagation:** Introduction structural Details of the ionosphere, Wave Propagation Mechanism, Refraction and Reflection of Sky Waves by ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation Between MUF and the Skip Distance, Multi-Hop Propagation, Wave Characteristics.	**8**

Text Book:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation", Tata McGraw Hill Publication.

Reference Books:

1. A. R. Harish, M. Sachidananda, "Antennas and Wave Propogation", Oxford University Press.
2. Edward Conrad Jordan and Keith George Balmain, "Electromagnetic Waves and Radiating Systems", PHI Publication.
3. A. Das, Sisir K. Das, "Microwave Engineering", Tata McGraw Hill Publication.

LABOROTARY

NEC 551R INTEGRATED CIRCUITS LAB

Objective: - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice and implemented using TL082, LM741, NE555, ASLK, MPY634 KP connecting wires, Power Supply, function generator and oscilloscope.

1. Design and test a function generator that can generate square wave and triangular wave output for a given frequency and cascade a multiplier MPY634KP in feedback loop to form VCO
2. Voltage to current and current to voltage convertors.
3. Second order filters using operational amplifier in universal active filter topology for –
    a. Low pass filter of specified cutoff frequency
    b. High pass filter of specified frequency
    c. Band pass filter with unit gain of specified pass band
    d. Design a notch filter to eliminate 50Hz power line frequency
4. Wien bridge oscillator using operational amplifier.
5. Astable and monostable multivibrator using IC 555.
6. Design the following amplifiers:
    a. A unity gain amplifier
    b. A non-inverting amplifier with a gain of 'A'
    c. An inverting amplifier with a gain of 'A'
    d. Log and antilog amplifiers.
    e. Voltage comparator and zero crossing detectors.
7. Design and test a PLL to get locked to a given frequency 'f'. Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied within the lock range.
8. Design and test the integrator for a given time constant.
9. Design and test a high-Q Band pass self-tuned filter for a given center frequency.
10. Design and test an AGC system for a given peak amplitude of sine-wave output.
11. Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250IC.
12. Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

Note: All listed experiments are compulsory. In addition to it, the Institutes may include more experiments based on the expertise.

NIC 551: Control System Lab

1. Different Toolboxes in MATLAB, Introduction to Control Systems Toolbox.
2. Determine transpose, inverse values of given matrix.
3. Plotthepole-zeroconfigurationins-planeforthegiventransferfunction.
4. Determinethetransferfunctionforgivenclosedloopsysteminblockdiagramrepresentation.
5. Plotunitstepresponseofgiventransferfunctionandfindpeakovershoot,peaktime.
6. Plot unit step response and to find rise time and delay time.
7. Plot locus of given transfer function, locate closed loop poles for different values of k.
8. Plot root locus of given transfer function and to find out S, Wd, Want given root & to discuss stability.
9. Plot Bode plot of given transfer function.
10. Plot Bode plot of given transfer function and find gain and phase margins
11. Plot Nyquist plot for given transfer function and to compare the irrelative stability
12. Plot the Nyquist plot for given transfer function and to discuss closed loop stability, gain

and phase margin.

Note:-In addition to it, Institutes may include more experiments based on the expertise.

NEC 552: Communication Lab - 1

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation
   a. using switching method
   b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-Uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz.

NEC 553: Microprocessors Lab

1. Write a program using 8085/ 8086 Microprocessor for Decimal, Hexadecimal addition and subtraction of two Numbers.
2. Write a program using 8085/ 8086 Microprocessor for addition and subtraction of two BCD numbers.
3. To perform multiplication and division of two 8 bit numbers using 8085/ 8086.
4. To find the largest and smallest number in an array of data using 8085/8086 instruction set.
5. To write a program to arrange an array of data in ascending and descending order using 8085/ 8086.
6. To convert given Hexadecimal number into its equivalent ASCII number and vice versa using 8085/ 8086 instruction set.
7. To write a program to initiate 8251 and to check the transmission and reception of character.
8. To interface 8253 programmable interval timer to 8085/ 8086 and verify the operation of 8253 in six different modes.
9. To interface DAC with 8085/ 8086 to demonstrate the generation of square, saw tooth and triangular wave.
10. Serial communication between two 8085/8086 through RS-232 C port.

Note:-In addition, Institutes may include two more experiments based on the expertise.

NEC 601 Microwave Engineering		
Unit	**Topic**	**Lectures**
I	Rectangular Wave Guide: Field Components, TE, TM Modes, Dominant TE_{10} mode, Field Distribution, Power, Attenuation. Circular Waveguides: TE, TM modes. Wave Velocities, Microstrip Transmission line (TL), Coupled TL, Strip TL, Coupled Strip Line, Coplanar TL, Microwave Cavities,	**8**
II	Scattering Matrix, Passive microwave devices: Microwave Hybrid Circuits, Terminations, Attenuators, Phase Shifters, Directional Couplers: Two Hole directional couplers, S Matrix of a Directional coupler, Hybrid Couplers, Microwave Propagation in ferrites, Faraday Rotation, Isolators, Circulators. Spara meter analysis of all components.	**8**
III	Microwave Tubes: Limitation of Conventional Active Devices at Microwave frequency, Two Cavity Klystron, Reflex Klystron, Magnetron, Traveling Wave Tube, Backward Wave Oscillators: Their Schematic, Principle of Operation, Performance Characteristic and their applications.	**8**
IV	Solid state amplifiers and oscillators: Microwave Bipolar Transistor, Microwave tunnel diode, Microwave Field-effect Transistor, Transferred electron devices, Avalanche Transit -time devices: IMP ATT Diode, TRAPPAT Diode.	**8**
V	Microwave Measurements: General setup of a microwave testbench, Slotted line carriage, VSWR Meter, microwave power measurements techniques, Crystal Detector, frequency measurement, wavelength measurements, Impedance and Refection coefficient, VSWR, Insertion and attenuation loss measurements, measurement of antenna characteristics, microwave link design.	**8**

Text Books:

1. Samuel Y. Liao, "Microwave Devices and Circuits", Pearson Education Publication.

Reference Books:

1. R.E Collin, "Foundation for Microwave Engineering", John Wiley India Publication
2. A. Das and S.K. Das," Microwave Engineering", Tata McGraw Hill Publication.

NEC 602 Digital Communication		
Unit	**Topic**	**Lectures**
I	Digital Data transmission, Line coding review, Pulse shaping, Scrambling, Digital receivers, Eye diagram, Digital carrier system, Method of generation and detection of coherent & non-coherent binary ASK, FSK & PSK, Differential phase shift keying, quadrature modulation techniques.(QPSK and MSK),M-ary Digital carrier Modulation.	8
II	Concept of Probability, Random variable, Statistical averages, Correlation, Sum of Random Variables, Central Limit Theorem, Random Process, Classification of Random Processes, Power spectral density, Multiple random processes.	8
III	Performance Analysis of Digital communication system: Optimum linear Detector for Binary polar signaling, General Binary Signaling, Coherent Receivers for Digital Carrier Modulations, Signal Space Analysis of Optimum Detection, Vector Decomposition of White Noise Random processes, General Expression for Error Probability of optimum receivers,	8
IV	Spread Spectrum Communications: Frequency Hopping Spread Spectrum (FHSS) systems, Direct Sequence Spread Spectrum, Code Division Multiple Access of DSSS, Multiuser Detection, OFDM Communications	8
V	Measure of Information, Source Encoding, Error Free Communication over a Noisy Channel capacity of a discrete and Continuous Memoryless channel Error Correcting codes: Hamming sphere, Hamming distance and Hamming bound, relation between minimum distance and error detecting and correcting capability, Linear block codes, encoding & syndrome decoding; Cyclic codes, encoder and decoders for systematic cycle codes; convolution codes, code tree & Trellis diagram, Viterbi and sequential decoding, burst error correction, Turbo codes.	8

Text Book:

1. B.P.Lathi,"Modern Digital and Analog Communication Systems", Oxford University Press Publication.

Reference Books:

1. H. Taub, D.L. Schilling, G. Saha,"Principles of Communications", McGraw-Hill International Publication.
2. Simon Haykin,"Communication Systems", Wiley India Publication.
3. H.P.HSU and D.Mitra,"Analog and Digital Communications", TataMcGraw-Hill Publication.

NEC 603 Integrated Circuit Technology		
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor -Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon, Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources, Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Books:

1. S. M. Sze, "VLSI Technology", McGraw Hill Publication.
2. S.K. Ghandhi, "VLSI Fabrication Principles", Willy-India Pvt. Ltd.

Reference Books:

1. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, Practice and Modelling", Pearson Education Publication.
2. Stephen A. Campbell, "Fabrication Engineering at the Micro and Nano scale", Oxford University Press.

Laboratory

NEC 651 ANTENNA AND MICROWAVE LAB

1. Study of Reflex Klystron Characteristics.
2. Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench.
4. Determine the S-parameter of any Three port Tee.
5. Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator.
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8. Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anti-Multi-Hole directional coupler.
9. To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

NEC 652 COMMUNICATION LAB – II

1. To construct a triangular wave with the help of Fundamental Frequency and its Harmonic component.
2. To construct a Square wave with the help of Fundamental Frequency and its Harmonic component.
3. Study of Pulse code modulation (PCM) and its demodulation using Bread Board.
4. Study of delta modulation and demodulation and observe effect of slope overload.
5. Study of pulse data coding techniques for NRZ formats.
6. Study of Data decoding techniques for NRZ formats.
7. Study of Manchester coding and decoding.
8. Study of Amplitude shift keying modulator and demodulator.
9. Study of Frequency shift keying modulator and demodulator.
10. Study of Phase shift keying modulator and demodulator
11. Study of single bit error detection and correction using Hamming code.
12. Measuring the input impedance and Attenuation of a given Transmission Line

NEC-653 CAD OF ELECTRONICS LAB

PSPICE Experiments

1. (a)Transient Analysis of BJT inverter using step input.
   (b)DC Analysis (VTC) of BJT inverter with and without parameters.
2. (a)Transient Analysis of NMOS inverter using step input.
   (b)Transient Analysis of NMOS inverter using pulse input.
   (c)DC Analysis (VTC) of NMOS inverter with and without parameters.
3. (a) Analysis of CMOS inverter using step input.
   (b)Transient Analysis of CMOS inverter using step input with parameters.
   (c)Transient Analysis of CMOS inverter using pulse input.
   (d)Transient Analysis of CMOS inverter using pulse input with parameters.
   (e)DC Analysis (VTC) of CMOS inverter with and without parameters.

4. Transient & DC Analysis of NOR Gate inverter.

5. Transient & DC Analysis of NAND Gate.
6. VHDL Experiments
    a. Synthesis and simulation of Full Adder.
    b. Synthesis and Simulation of Full Subtractor.
    c. Synthesis and Simulation of 3 X 8 Decoder.
    d. Synthesis and Simulation of 8 X 1 Multiplexer.
    e. Synthesis and Simulation of 9 bit odd parity generator.
    f. Synthesis and Simulation of Flip Flop (D, and T).

NEC 655 MICROCONTROLLERS FOR EMBEDDED SYSTEMS LAB

1. Write a program of Flashing LED connected to port 1 of the 8051 Micro Controller
2. Write a program to generate 10 kHz square wave using 8051.
3. Write a program to show the use of INT0 and INT1 of 8051.
4. Write a program for temperature & to display on intelligent LCD display.
5. Write a program to generate a Ramp waveform using DAC with micro controller.
6. Write a program to Interface GPIO ports in C using MSP430 (blinking LEDs , push buttons)
7. Write a program Interface potentiometer with GPIO.
8. Write a program of PWM based Speed Control of Motor controlled by potentiometer connected to GPIO.
9. Write a program of PWM generation using Timer on MSP430 GPIO.
10. Write a program to Interface an accelerometer.
11. Write a program using USB (Sending data back and forth across a bulk transfer-mode USB connection.)
12. Write a program for Master Slave Communication between 2 MSP430s using SPI
13. Write a program of basic Wi-Fi application – Communication between two MSP430 based sensor nodes.
14. Setting up the CC3100 as a HTTP server.
15. Review of User APIs for TI CC3100 & Initialization and Setting of IP addresses.

Electives Subjects

NEC 011 Digital Signal Processing		
Unit	**Topic**	**Lectures**
I	**Realization of Digital Systems:** Introduction, direct form realization of IIR systems, cascade realization of an IIR systems, parallel form realization of an IIR systems, Ladder structures: continued fraction expansion of H (z), example of continued fraction, realization of a ladder structure, example of a ladder realization.	8
II	**Design of Infinite Impulse Response Digital Filters:** Introduction to Filters, Impulse Invariant Transformation, Bi-Linear Transformation, All- Pole Analog Filters: Butterworth and Chebyshev, Design of Digital Butterworth and Chebyshev Filters.	8
III	**Finite Impulse Response Filter Design:** Windowing and the Rectangular Window, Other Commonly Used Windows, Examples of Filter Designs Using Windows, The Kaiser Window.	8
IV	**Discrete Fourier Transforms:** Definitions, Properties of the DFT, Circular Convolution, Linear Convolution.	8
V	**Fast Fourier Transform Algorithms:** Introduction, Decimation -In Time (DIT) Algorithm, Computational Efficiency, Decimation in Frequency (DIF) Algorithm.	8

Text Book:

1. Johnny R. Johnson, "Digital Signal Processing", PHI Publication.

Reference Books:

1. John G Prokias, Dimitris G Manolakis, "Digital Signal Processing", Pearson Education.
2. Oppenheim & Schafer, "Digital Signal Processing" PHI Publication.
3. Sanjit K. Mitra, "Digital Signal Processing: A Computer-Based Approach", McGraw Hill Publication.
4. Monson Hayes, "Digital Signal Processing", McGraw Hill Education Publication.

NEC 012 Computer Architecture and Organization		
Unit	**Topic**	**Lectures**
I	Introduction to Design Methodology: System Design - System representation, Design Process, the gate level (revision), the register level components and PLD (revision), register level design The Processor Level: Processor level components, Processor level design.	8
II	Processor basics: CPU organization- Fundamentals, Additional features Data Representation - Basic formats, Fixed point numbers, Floating point numbers. Instruction sets - Formats, Types, Programming considerations.	8

III	Data path Design: Fixed point arithmetic - Addition and subtraction, Multiplication and Division, Floating point arithmetic, pipelining.	8
IV	Control Design: basic concepts - introduction, hardwired control, Micro programmed control -introduction, multiplier control unit, CPU control unit, Pipeline control- instruction pipelines, pipeline performance.	8
V	Memory organization: Multi level memories, Address translation, Memory allocation, Caches - Main features, Address mapping, structure vs performance, System Organization: Communication methods- basic concepts, bus control. Introduction to VHDL.	8

TextBooks:

1. John P Hayes "Computer Architecture and Organisation", McGraw Hill Publication.

Reference Books:

1. M Morris Mano, "Computer System Architecture", Pearson Publication.
2. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill Publication.
3. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Elsevier Publication.

NEC 013 Artificial Neural Network		
Unit	**Topic**	**Lectures**
I	**Introduction to ANN** Features, structure and working of Biological Neural Network Trends in Computing Comparison of BNN and ANN. **Basics of Artificial Neural Networks -** History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch - Pitts model, Perceptron, Ada line model, Basic learning laws, Topology of neural network architecture.	8
II	**Back propagation networks** : (BPN) Architecture of feed forward network, single layer ANN, multilayer perceptron, back propagation learning, input - hidden and output layer computation, back propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning.	8
III	**Activation & Synaptic Dynamics** : Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks. **Basic functional units of ANN for pattern recognition tasks:** Basic feed forward, Basic feedback and basic competitive learning neural network. Pattern association, pattern classification and pattern mapping tasks.	8

IV	**a)Feedforward neural networks -** - Linear responsibility X-OR problem and solution. - Analysis of pattern mapping networks summary of basic gradient search methods. **b) Feedback neural networks Pattern** Storage networks, stochastic networks and simulated annealing, Boltzmann machine and Boltzmann learning.	8
V	**Competitive learning neural networks** : Components of CL network pattern clustering and feature. Mapping network, ART networks, Features of ART models, character recognition using ART network. **Applications of ANN**: Pattern classification - Recognition of Olympic games symbols, Recognition of printed Characters. Neocognitron - Recognition of handwritten characters. NET Talk: to convert English text to speech. Recognition of consonant vowel (CV) segments, texture classification and segmentation.	8

Text Book:

1. B. Yegnanarayana, "Artificial neural Networks", PHI Publication.

Reference Books:

1. S. Raj Sekaran , Vijayalakshmi Pari," Neural networks, Fuzzy logic and Genetic Algorithms", PHI Publication.
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", TMH Publication.

NEC-013R REAL TIME SYSTEMS		
Unit	**Topic**	**Lectures**
I	**Introduction to Real Time System** Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc.,) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc.,).	8

II	**Embedded Hardware for Real Time System** Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc.,), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.	10
III	**Embedded Hardware – On chip Peripherals and Communication protocols** Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART. **Introduction to the CCS IDE:** its features, project options and basic examples Analog-to-Digital Converter Lab: Build a data acquisition system Control Peripherals Lab: Generate and graph a PWM waveform Direct Memory Access (DMA) Lab: Use DMA to buffer ADC results.	12
IV	**Embedded Software and RTOS** Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking.	8
V	**Introduction to TI C2000:** Interface with actuators such as motor control enabling real time capabilities of C2000 Program to demonstrate the Task switching Simulation on CCS IDE To demonstrate the blink led application Using Hwi (Hardware Interrupt: periodically to produce an interrupt using Timers) of TI RTOS. **Programming:** demonstrate the Blink led application Using a Swi (Software interrupt) of TI RTOS To introduce two time-based SYS/BIOS services – Clock and Timestamp in TI RTOS; demonstrate the Task synchronization using Semaphores using TI RTOS; demonstrate Inter Task Communication Using of Mailboxes and Queues using TI RTOS; demonstrate the Communication Protocols – I2C, SPI and USART using TI.	10

Text Book:

1. Real-Time Systems by Jane W. S. Liu Prentice Hall Publication
2. Krishna .C.M "Real Time Systems" Mc-Graw Hill Publication.

3. Hamid A. Toliyat and Steven G. Campbell, “DSP based Electromechanical Motion Control” CRC Press Publication.
4. Jean J Labrosse, “Embedded System Design blocks”, CMP books Publication
5. John H Davies, “MSP430 Microcontroller Basics” Newnes Publication.

Reference Book:

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Publication
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Publication
3. C2000 Teaching CD ROM from Texas Instruments Publication
4. Introduction to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments Publication.

NEC 014 Advance Semiconductor Devices		
Unit	**Topic**	**Lectures**
I	**Physics and Properties of Semiconductors:** Introduction, Crystal Structure, Energy Bands and Energy Gap, Carrier Concentration at Thermal Equilibrium, Carrier-Transport Phenomena. Phonon, Optical, and Thermal Properties, Heterojunctions and Nanostructures, Basic Equations and Examples. *p-n* Junctions, Introduction, Depletion Region, Current-Voltage Characteristics, Junction Breakdown, Transient Behavior and Noise, Terminal Functions, Heterojunctions. Metal-Semiconductor Contacts, Metal-Insulator - Semiconductor Capacitors.	**8**
II	**Bipolar Transistors:** Static Characteristics, Microwave Characteristics, Related Device Structures, Heterojunction Bipolar Transistor. **MOSFETs:** Basic Device Characteristics, Nonuniform Doping and Buried-Channel Device, Device Scaling and Short-Channel Effects, MOSFET Structures, Circuit Applications, Nonvolatile Memory Devices, Single-Electron Transistor. JFETs, MESFETs, and MODFETs	**8**
III	**Tunnel Devices:** Tunnel Diode, Related Tunnel Devices, Resonant-Tunneling Diode. **IMPATT Diodes:** Static Characteristics, Dynamic Characteristics, Power and Efficiency, Noise Behavior, Device Design and Performance, BARITT Diode, TUNNETT Diode.	**8**
IV	Transferred-Electron and Real-Space-Transfer Devices Thyristors and Power Devices **Photonic Devices and Sensors:** Radioative Transitions, Light-Emitting Diode (LED), Laser Physics, Laser Operating Characteristics, Specialty Lasers.	**8**
V	**Photodetectors and Solar Cells:** Photoconductor, Photodiodes, Avalanche Photodiode, Phototransistor, Charge-Coupled Device (CCD), Metal-Semiconductor-Metal Photodetector, Quantum-Well Infrared Photodetector, Solar Cell. Sensors: Thermal Sensors, Mechanical Sensors, Magnetic Sensors, Chemical Sensors.	**8**

Text Book:

1. S. M. Sze, Kwok K. NG, "Physics of Semiconductor Devices", Wiley Publication.

Reference Books:

1. J. P. Colinge and C. A. Colinge, "Physics of Semiconductor Devices", Kluwer Academic Publishers

NEC 021 Industrial Electronics		
Unit	**Topic**	**Lectures**
I	**Power Semiconductor Devices:** Power semiconductor devices their symbols and static characteristics and specifications of switches, types of power electronic circuits Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT Thyristor -Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC.	**8**
II	**Phase Controlled Rectifiers:** Phase Angle Control, Single-phase Half-wave Controlled Rectifier (One quadrant), Single-phase Full-wave Controlled Rectifier (Two quadrant Converters),Performance Factors of Line-commutated Converters, The Performance Measures of Two-pulse Converters, Three phase Controlled Converters **Inverters:** Introduction Thyristor Inverter Classification, Series Inverters, Parallel Inverter, Three-phase Bridge Inverters, Three-phase Bridge Inverter with Input-circuit Commutation.	**8**
III	**Choppers:** Introduction, Principle of Chopper Operation, Control Strategies, step-up/Down Chopper, Jones Chopper. Introduction to basic Cycloconverters. **Control of D.C. Drives:** Introduction, Basic Machine Equations, Breaking Modes, Schemes for D.C. Motor Speed Control, Single-phase Separately Excited Drives, Braking Operation of Rectifier Controlled Separately excited Motor, Single-phase Separately Excited Drives, Power Factor Improvement, Three-phase Separately Excited Drives, D.C. Chopper Drives	**8**
IV	**Control of A.C. Drives:** Introduction, basic Principle of Operation, Squirrel-cage Rotor Design, Speed Control of Induction Motors, stator Voltage Control, Variable Frequency control, Rotor Resistance Control, Slip Power Recovery Scheme, Synchronous Motor Drives	**8**

Text Books:

1. M. H. Rashid, "Power Electronics", Pearson Education Publication.

Reference Books:

1. M. D. Singh & K. Khanchandani, "Power Electronics", Tata McGraw Hill Publication.
2. V.R. Moorthy, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press,
3. M.S. Jamil Asghar, "Power Electronics", PHI Publication.

NEC 022R Microcontrollers for Embedded Systems		
Unit	**Topic**	**Lectures**
I	Introduction , Microcontrollers and Embedded systems, Overview of the 8051, Inside the 8051, Addressing modes, assembly programming, 8051 data types and directives, Interfacing with 8051, Programming the 8051 timers.	6
II	MSP430x5x series block diagram, address space, on-chip peripherals (analog and digital), and Register sets. Instruction set, instruction formats, and various addressing modes of 16-bit microcontroller; Sample embedded system on MSP430 microcontroller. Memory Mapped Peripherals, programming System registers, I/O pin multiplexing, pull up/down registers, GPIO control. Interrupts and interrupt programming.	8
III	Watch dog timer, system clocks, Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.	10
IV	Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices.	10
V	Internet of Things (IoT) overview and architecture, Overview of wireless sensor networks and design examples. Various wireless connectivity: NFC, ZigBee, Bluetooth, Bluetooth Low Energy, Wi-Fi. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications, Building IoT applications using CC3100 user API for connecting sensors.	6

Text Book:

1. Mazidi Ali Muhammad, Mazidi Gillispie Janice, and Mc Kinlay Rolin D " The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Publication.
2. John H Davies, "MSP430 Microcontroller Basics" Newnes Publication.

Reference Book:

1. TI MSP430x5xx and MSP430x6xx Family User's Guide..

NEC 023 Analog Signal Processing		
Unit	**Topic**	**Lectures**
I	Introduction to domains and the analogue/digital trade off, Introduction to basic building blocks: null or, voltage feedback amplifier, operation transconductance amplifier, current conveyor, current feedback amplifier. Analog signal filtering: introduction to bilinear transfer functions and active realizations. First-order and second-order filter realization, filter design parameters (Q and ω0), frequency response, effect of finite gain of op-amp, realization of Single-Amplifier Biquad and General Impedance Convertor circuit.	8
II	Ideal low-pass filter, Buttreworth and Chebyshev magnitude response, pole locations, low-pass filter specifications.	8
III	Delay equalization: equalization procedures, equalization with first-order and second-order modules, strategies for equalization design. Definition of Bode sensitivity.	8
IV	Properties of Lossless ladders, the general impedance convertor (GIC), optimal design of the GIC, realization of simple ladders, Gorski-Popiel's Embedding Technique, Bruton's FDNR technique, creating negative components.	8

Text Books:

1. R. Schaumann and M.E. Valkenberg," Design of Analog Circuits", Oxford University

NEC 024R Advanced Digital System Design using Verilog		
Unit	**Topic**	**Lectures**
I	**Introduction to Verilog HDL:** Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Functional Verification, System Tasks, Programming Language Interface (PLI), Module, Simulation and Synthesis Tools. **Language Constructs and Conventions:** Introduction, Keywords, Identifiers, White Space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data Types, Scalars and Vectors, Parameters, Operators.	8
II	**Gate Level Modeling:** Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tri-State Gates, Array of Instances of Primitives, Design of Flip-flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuits. **Modeling at Dataflow Level:** Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.	8

III	**Behavioral Modeling:** Introduction, Operations and Assignments, Functional Bifurcation, Initial Construct, Always Construct, Assignments with Delays, Wait construct, Multiple Always Blocks, Designs at Behavioral Level, Blocking and Non-Blocking Assignments, The case statement, Simulation Flow i*f* and i*f*-else constructs, Assign-De-Assign construct, Repeat construct, for loop, the Disable construct, While loop, Forever loop, Parallel Blocks, Force-Release construct, Event. **Switch Level Modeling:** Basic Transistor Switches, CMOS Switch, Bi-directional Gates, Time Delays with Switch Primitives, Instantiations with Strengths and Delays, Strength Contention with Trireg Nets, Exercises.	8
IV	**System Tasks, Functions and Compiler Directives:** Parameters, Path Delays, Module Parameters, System Tasks and Functions, File-Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives. **Sequential Circuit Description:** Sequential Models – Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis.	8
V	**Components Test and Verification:** Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification. Factoring, Decomposition, BDD, Ordered BDD, LPDD, Fault Detection and Analysis in combinational and sequential systems.	8

Text Books:

1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL", Wiley Publication.

2. Zainalabdien Navabi, Verilog Digital System Design, TMH Publication.

3. Richard F. Tinder, "Engineering Digital Design", Academic Press Publication.

Reference Books:

1. Stephen. Brown and Zvonko Vranesic," Fundamentals of Logic Design with Verilog Design", TMH Publication.

2. Sunggu Lee ,"Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA ", Cengage Learning Publication.

3. Samir Palnitkar , "Verilog HDL", 2nd Edition, Pearson Education Publication.

4. Michael D. Ciletti , "Advanced Digital Design with Verilog HDL ", PHI Publication.

5. Parag K. Lala, "Digital System Design Using PLDs", PHI India Ltd.

UTTAR PRADESH TECHNICAL UNIVERSITY
LUCKNOW

SYLLABUS

Bachelor of Electrical Engineering

3rd Year (V & VI Semester)

(Effective from Session 2015-2016)

EVELUATION SCHEME OF ELECTRICAL ENGINEERING

Third Year

ELECTRICAL ENGG- Semester-V

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
						Sessional Assessment			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECT											
1	NEE-501	Elements Of Power System	3	1	0	30	20	50	100	150	4
2	NEE 502	Power Electronics	3	1	0	30	20	50	100	150	4
3	NEE-503	Control System	3	1	0	30	20	50	100	150	4
4	NEE-504	Microprocessor & Its Applications	3	1	0	30	20	50	100	150	4
5	NEC-508	Fundamentals of E.M. Theory	2	1	0	15	10	25	50	75	3
6	NHU-501	Engineering Economics	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-551	Power Electronics Lab	0	0	3	10	10	20	30	50	1
8	NEE 552	Control System Lab	0	0	3	10	10	20	30	50	1
9	NEE-553	Microprocessor Lab	0	0	2	10	10	20	30	50	1
10	NEE 554	Simulation Based Minor Project	0	0	2	10	10	20	30	50	1
11	NGP 501	GP						50		50	1
		TOTAL	16	5	10					1000	26

ELECTRICAL ENGG. -Semester-VI

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NEE-601	Power System Analysis	3	1	0	30	20	50	100	150	4
2	NEE 602	Switchgear & Protection	3	1	0	30	20	50	100	150	4
3	NEE-603	Special Electric Machine	3	1	0	30	20	50	100	150	4
4	NEE-011 / NEE-014	Departmental Elective-I	3	1	0	30	20	50	100	150	4
5	NEE-021 / NEE-024	Departmental Elective-II	2	1	0	15	10	25	50	75	3
6	NHU-601	Industrial Management	2	0	0	15	10	25	50	75	2
PRACTICAL/DESIGN/DRAWING											
7	NEE-651	Power System Lab	0	0	2	10	10	20	30	50	1
8	NEE-652	Electrical CAD Lab	0	0	3	10	10	20	30	50	1
9	NEE-653	Minor Project	0	0	2	10	10	20	30	50	1
10	NEE 654	Seminar	0	0	3		50	50		50	1
11	NGP 601	GP						50		50	1
		TOTAL	16	5	10					1000	26

Elective-I

NEE – 011: Digital Control System
NEE - 012: Fundamentals of Digital Signal Processing
NEE - 013: Neural Networks and Fuzzy System
NEE - 014: Power Theft and Energy Management

Elective-II

NEE – 021: High Voltage Engineering
NEE -022: Intelligent Instrumentation
NEE -023: Conventional & CAD of Electrical Machines
NEE -024: Smart Energy Delivery Systems

NEE-501: ELEMENTS OF POWER SYSTEM

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<u>Unit-I</u>

Power System Components:
Single line Diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator

Supply System
Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:
Configurations, types of conductors, resistance of line, skin effect, Kelvin's law.Proximity effect

Unit-II

Over Head Transmission Lines
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect. Surge impedance loading

Unit-III

Corona and Interference:
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines

Overhead line Insulators:
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency

Unit-IV

Mechanical Design of transmission line:
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers

Insulated cables:
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit-V

Neutral grounding:
Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices

Electrical Design of Transmission Line:
Design consideration of EHV transmission lines, choice of voltage, number of circuits, conductor configuration, insulation design, selection of ground wires.

EHV AC and HVDC Transmission:
Introduction to EHV AC and HVDC transmission lines.

Text Books

1.W. D. Stevenson, "Element of Power System Analysis", McGraw Hill,
2.C. L. Wadhwa, "Electrical Power Systems" New age international Ltd. Third Edition
3.Asfaq Hussain, "'Power System", CBS Publishers and Distributors,
4.B. R. Gupta, "Power System Analysis and Design" Third Edition, S. Chand & Co.
5.M. V. Deshpande, "Electrical Power System Design" Tata Mc Graw Hill.

Reference Books

6.Soni, Gupta & Bhatnagar, "A Course in Electrical Power", Dhanpat Rai & sons,
7.S. L. Uppal, "Electric Power", Khanna Publishers
8.S.N.Singh, " Electric Power Generation, Transmission& distribution." PHI Learning

NEE-502:POWER ELECTRONICS

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Unit-I

Power semiconductor Devices:

Power semiconductor devices their symbols and static characteristics, specifications of switches, types of power electronic circuits,Operation, steady state & switch characteristics & switching limits of Power Transistor Operation and steady state characteristics of Power MOSFET and IGBT

Thyristor – Operation V- I characteristics, two transistor model, methods of turn-on Operation of GTO, MCT and TRIAC

Unit-II

Power Semiconductor Devices (Contd.)

Protection of devices, Series and parallel operation of thyristors Commutation techniques of thyristor

DC-DC Converters:

Principles of step-down chopper, step down chopper with R-L load Principle of step-up chopper, and operation with RL load, classification of choppers and their various applications.

Unit-III

Phase Controlled Converters

Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.

Single phase fully controlled and half controlled bridge converters. Performance Parameters

Three phase half wave converters, three phase fully controlled and half controlled bridge converters, Effect of source impedance Single phase and three phase dual converters

Unit-IV

AC Voltage Controllers

Principle of On-Off and phase controls

Single phase ac voltage controller with resistive and inductive loads

Three phase ac voltage controllers (various configurations and comparison only)

Single phase transformer taps changer, industrial applications.

Cyclo Converters

Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation and their applications.

Unit-V

Inverters

Single phase series resonant inverter,Single phase bridge inverters,Three phase bridge inverters

Voltage control of inverters,Harmonics reduction techniques,Single phase and three phase current source inverters

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Prentice Hall of India Ltd. 3rd Edition,2004.
2. M.D. Singh and K.B.Khanchandani, "Power Electronics"Tata MC Graw Hill, 2005
3. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press.

Reference Books:

4. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd.
5. Chakrabarti & Rai, "Fundamentals of Power Electronics &Drives"Dhanpat Rai & Sons.
6. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008.
7. S.N.Singh, "A Text Book of Power Electronics" Dhanpat Rai & Sons

NEE-503: CONTROL SYSTEM

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Unit-I

The Control System:

Open loop & closed control; servomechanism, Physical examples. Transfer functions, Block diagram algebra, Signal flow graph, Mason's gain formula Reduction of parameter variation and effects of disturbance by using negative feedback

Unit-II

Time Response analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants

Design specifications of second order systems: Derivative error, derivative output, integral error and PID compensations, design considerations for higher order systems, performance indices

Unit-III

Control System Components:

Constructional and working concept of ac servomotor, synchros and stepper motor

Stability and Algebraic Criteria concept of stability and necessary conditions, Routh-Hurwitz criteria and limitations.

Root Locus Technique:

The root locus concepts, construction of root loci

Unit-IV

Frequency response Analysis: Frequency response, correlation between time and frequency responses, polar and inverse polar plots, Bode plots

Stability in Frequency Domain:

Nyquist stability criterion, assessment of relative stability: gain margin and phase margin, constant M&N circles

Unit-V

Introduction to Design:

The design problem and preliminary considerations lead, lag and lead-lag networks, design of closed loop systems using compensation techniques in time domain and frequency domain.

Review of state variable technique:

Review of state variable technique, conversion of state variable model to transfer function model and vice-versa, diagonalization, Controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.
2. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" Wiley India Ltd.
4. D.Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.
6. Ajit K Mandal, "Introduction to Control Engineering" New Age International.
7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, "Design of Feedback Control Systems" Oxford University Press.
8. Samarjit Ghosh, " Control Systems theory and Applications", Pearson Education

NEE-504: MICROPROCESSORS

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UNIT-I:

Introduction to Digital Computer and Microprocessor:

Digital Computers: General architecture and brief description of elements, instruction execution, instruction format, and instruction set, addressing modes, programming system, higher lever languages.

Buses and CPU Timings: Bus size and signals, machine cycle timing diagram, instruction timing, processor timing.

Microprocessor and Microprocessor Development Systems: Evolution of Microprocessor, Microprocessor architecture and its operations, memory, inputs-outputs (I/Os), data transfer schemes interfacing devices, architecture advancements of microprocessors, typical microprocessor development system.

UNIT-II:

8-bit Microprocessors.

8085 microprocessor: pin configuration, internal architecture. Timing & Signals: control and status, interrupt: ALU, machine cycles,

Instruction Set of 8085:

Addressing Modes: Register addressing, direct addressing; register indirect addressing, immediate addressing, and implicit addressing.

Instruction format, op-codes, mnemonics, no. of bytes, RTL, variants, no. of machine cycles and T states, addressing modes.

Instruction Classification: Data transfer, arithmetic operations, logical operations, branching operation, machine control; Writing assembly Language programs, Assember directives.

UNIT-III:

16-bit Microprocessors: Architecture:

Architecture of INTEL 8086 (Bus Interface Unit, Execution unit), register organization, memory addressing, memory segmentation,

Operating Modes

Instruction Set of 8086

Addressing Modes**:** Instruction format:

Discussion on instruction Set: Groups: data transfer, arithmetic , logic string, branch control transfer, processor control.

Interrupts: Hardware and software interrupts, responses and types.

UNIT-IV

Fundamental of Programming: development of algorithms, flowcharts in terms of structures,(series, parallel, if-then-else etc.)

Assembler Level Programming: memory space allocation (mother board and user program) Assembler level programs (ASMs)

UNIT-V

Peripheral Interfacing:

I/O programming: Programmed I/O, Interrupt Driven I/O, DMA I/O interface: serial and parallel communication, memory I/O mapped I/Os. Peripheral Devices: 8237 DMA controller, 8255-Programmable peripheral interface, 8253/8254 Programmable timer/counter.

8259 programmable Interrupt Controller.

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Uffenbeck, John, “Microcomputers and Microprocessors” PHI/ 3rd Edition.
3. Ray, A.K. & Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.

4. Krishna Kant, “Microprocessors and Microcontrollers” PHI Learning.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. ADitya P Mathur, “Introduction to Microprocessor” Tata Mc Graw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P.Singh, “Microprocessor and Interfacing and applications” New Age International
10. N. Senthil Kumar, “Microprocessors and Microcontroller”, Oxford University Press.
11. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family” Prentice Hall (India)

NEC-508: FUNDAMENTALS OF E.M.THEORY

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Unit I

Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation, divergence, gradient and cvrl in different coordinate systems, Electric field intensity, Electric Flux density, Energy and potential.

Unit-II

Current and conductors, Dielectrics and capacitance, Poisson's and Laplace's equations.

Unit-III

Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.

Unit-IV

Uniform Plane waves, Plane wave reflection and dispersion

Text Books:

1. Hayt, W.H. and Buck, J.A., "Engineering Electromagnetic" Tata Mc.Graw Hill Publishing
2. Mathew Sadiku, "Electromagnetic Field Theory", Oxford University Press.

Reference Books:

3. Jordan E.C. and Balmain K.G., "Electromagnetic Wave and radiating Systems" Prentice Hall International , 2nd Edition.
4. Kraus, F. "Electromagnetic" Tata Mc. Graw Hill 5th Edition.
5. Ramo S, Whinnery T.R. and Vanduzer T, "Field and Waves in Communication Electronics" John Wiely and Sons 3rd Edition

NEE-551: POWER ELECTRONICS LABORATORY

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Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study V-I characteristics of SCR and measure latching and holding currents.
2. To study UJT trigger circuit for half wave and full wave control.
3. To study single-phase half wave controlled rectified with (i) resistive load (ii) inductive load with and without free wheeling diode.
4. To study single phase (i) fully controlled (ii) half controlled bridge rectifiers with resistive and inductive loads.
5. To study three-phase fully/half controlled bridge rectifier with resistive and inductive loads.
6. To study single-phase ac voltage regulator with resistive and inductive loads.
7. To study single phase cyclo-converter
8. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
9. To study operation of IGBT/MOSFET chopper circuit
10. To study MOSFET/IGBT based single-phase series-resonant inverter.
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB)

12. To obtain simulation of SCR and GTO thyristor.
13. To obtain simulation of Power Transistor and IGBT.
14. To obtain simulation of single phase fully controlled bridge rectifier and draw load voltage and load current waveform for inductive load.
15. To obtain simulation of single phase full wave ac voltage controller and draw load voltage and load current waveforms for inductive load.
16. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.
17.

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics” Prentice hall Inc.
3. Randal Shaffer, “Fundamentals of Power Electronics with MATLAB” Firewall Media,

NEE– 552: CONTROL SYSTEM LABORATORY

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Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions at various loads.

Software based experiments (Use MATLAB, LABVIEW software etc.)

10. To simulate PID controller for transportation lag.
11. To determine time domain response of a second order system for step input and obtain performance parameters.
12. To convert transfer function of a system into state space form and vice-versa.
13. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
14. To plot a Bode diagram of an open loop transfer function.
15. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata Mc Graw Hill.

NEE-553: MICROPROCESSOR LABORATORY

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A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from ^{0}F to ^{0}C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.

EEE-601: POWER SYSTEM ANALYSIS

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Unit-I

Representation of Power System Components:
Synchronous machines, Transformers,Transmission lines, One line diagram, Impedance and reactance diagram, per unit System

Symmetrical components:
Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II

Symmetrical fault analysis:
Transient in R-L series circuit, calculation of 3-phase short circuit current and reactance of synchronous machine, internal voltage of loaded machines under transient conditions

Unsymmetrical faults:
Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Z_{bus} using singular transformation and algorithm, computer method for short circuit calculations

Unit-III Load Flows:
Introduction, bus classifications, nodal admittance matrix (Y_{BUS}), development of load flow equations,

load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equations and fast decoupled method

Unit-IV

Power System Stability:
Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement

Unit-V Traveling Waves:
Wave equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Books:

1. W.D. Stevenson, Jr. " Elements of Power System Analysis", Mc Graw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni,Gupta & Bhatnagar, "Power System Engineering", Dhanpat Rai & Co.
4. T.K Nagsarkar & M.S. Sukhija, "Power System Analysis" Oxford University Press,2007.

Reference Books:

5. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
6. Hadi Sadat; "Power System Analysis", Tata McGraw Hill.
7. D.Das, " Electrical Power Systems" New Age International.
8. J.D. Glover, M.S. Sharma & T.J.Overbye, "Power System Analysis and Design" Thomson.
9. P.S.R. Murthy " Power System Analysis" B.S. Publications.
10. Stagg and El-Abiad, "Computer Methods in Power System Analysis" Tata Mc Graw Hill
11. Kothari & Nagrath, "Modern Power System Analysis" Tata Mc. Graw Hill.

NEE – 602: SWITCHGEAR AND PROTECTION

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3 1 0

<u>Unit I:</u>

Introduction to Protection System:
Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology.

Relays:
Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.

<u>Unit-II:</u>

Relay Application and Characteristics:
Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay

Static Relays:
Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.

Unit-III

Protection of Transmission Line:
Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing,

<u>Unit-IV:</u>

Circuit Breaking:
Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings.

Testing Of Circuit Breaker:
Classification, testing station and equipments, testing procedure, direct and indirect testing

<u>Unit-V</u>

Apparatus Protection:
Protection of Transformer, generator and motor.

Circuit Breaker:
Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF6, Vacuum and d. c. circuit breakers.

Text Books:

1. S. S. Rao, “Switchgear and Protection”, Khanna Publishers.
2. B. Ravindranath and M. Chander, Power system Protection and Switchgear,Wiley Eastern Ltd.

Reference Books:

3. B. Ram and D. N. Vishwakarma, “Power System Protection and Switchgear”, Tata Mc. Graw Hill
4. Y. G. Paithankar and S R Bhide, “Fundamentals of Power System Protection”, Prentice Hall of India.
5. T.S.M Rao,“Power System Protection: Static Relays with Microprocessor Applications” Tata Macgraw Hill”.
6. A.R. Van C. Warringtaon , “ Protective Relays- Their Theory and Practice, Vol. I & II” Jhon Willey & Sons.

NEE-603: SPECIAL ELECTRICAL MACHINES

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3 1 0

UNIT-I

Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power)

UNIT-II

Single phase Induction Motors:

Construction, starting characteristics and applications of split phase, capacitor start, capacitor run, capacitor-start capacitor-run and shaded pole motors.

Two Phase AC Servomotors:

Construction, torque-speed characteristics, performance and applications.

UNIT-III Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:

Construction; principle of operation; torque production, modes of operation, drive circuits.

UNIT-IV

Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect, permanent magnet dc motors, sinusoidal PM ac motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V

Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.
2. P.C. Sen " Principles of Electrical Machines and Power Electronics" John willey & Sons, 2001
3. G.K.Dubey "Fundamentals of Electric Drives" Narosa Publishing House, 2001

Reference Books:

4. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987
5. M.G. Say " Alternating current Machines" Pitman & Sons .

DEPARTMENTAL ELECTIVES

ELECTIVE – I

NEE – 011: Digital Control System

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3 1 0

UNIT-I

Signal Processing in Digital Control:

Basic digital control system, advantages of digital control and implementation problems, basic discrete time signals, z-transform and inverse z-transform, modeling of sample- hold circuit., pulse transfer function, solution of difference equation by z-Transform method.

UNIT-II

Design of Digital Control Algorithms:

Steady state accuracy, transient response and frequency response specifications, digital compensator design using frequency response plots and root locus plots.

UNIT-III

State Space Analysis and Design:

State space representation of digital control system, conversion of state variable models to transfer functions and vice versa, solution of state difference equations, controllability and observability, design of digital control system with state feedback.

UNIT-IV

Stability of Discrete System:

Stability on the z-plane and Jury stability criterion, bilinear transformation, Routh stability criterion on rth plane.

Lyapunov's Stability in the sense of Lyapunov, stability theorems for continuous and discrete systems, stability analysis using Lyapunov's method.

UNIT-V

Optimal digital control :

Discrete Euler Lagrange equation, max. min. principle, optimality & Dynamic programming, Different types of problem and their solutions.

Text Books:

1. B.C.Kuo, "Digital Control System",Saunders College Publishing.
2. M.Gopal, "Digital Control and State Variable Methods", Tata McGraw Hill.

Reference Books:

3. J.R.Leigh, "Applied Digital Control", Prentice Hall, International
4. C.H. Houpis and G.B.Lamont, "Digital Control Systems:Theory, hardware, Software",Mc Graw Hill.

NEE - 012: FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

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Unit-I

Discrete-Time Signals And Systems:

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Discrete Fourier Transform:

Discrete Fourier transforms, properties, linear convolution using DFT, DCT

Unit-II

Sampling of Continuous Time Signals:

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III

Transform Analysis of LTI Systems:

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase

Overview of finite precision numerical effects, effects of coefficient quantization,Effects of round-off noise in digital filters, zero-input limit cycles in fixed point realizations of IIR digital filters.

Unit-IV

Filter Design Techniques:

Design of D-T IIR filters from continuous – time filters, design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters, FIR equiripple approximation

Unit-V

Efficient computation of the DFT:

Goertzel algorithm, decimation in time and decimation in frequency, FFT algorithm, practical considerations, implementation of the DFT using convolution, effects of finite register length.

Fourier Analysis of Signals Using DFT :

DFT analysis of sinusoidal signals, time-dependent Fourier transforms: Block convolution, Fourier analysis of non – stationary and stationary random signals, spectrum analysis of random signals using estimates of the autocorrelation sequence

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. & Manolakis, D.G.,” Digital Signal Processing: Principles Algorithms and Applications”, Prentice Hall of India.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, Prentice Hall of India.
5. Oppenheim, Alan V. & Willsky, Alan S. , “Signals and Systems” , Prentice Hall of India, 2nd Edition
6. Johnson, J.R. , “Introduction to Digital Signal Processing”, Prentice Hall of India.

NEE - 013: NEURAL NETWORKS AND FUZZY SYSTEM

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3 1 0

Unit-I

Neural Networks-1(Introduction & Architecture)

Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks.Various learning techniques; perception and convergence rule,
Auto-associative and hetro-associative memory

Unit-II

Neural Networks-II (Back propogation networks)

Architecture: perceptron model, solution, single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III

Fuzzy Logic-I (Introduction)

Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

Unit-IV

Fuzzy Logic –II (Fuzzy Membership, Rules)

Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-V

Fuzzy Neural Networks:

L-R Type fuzzy numbers, fuzzy neutron, fuzzy back propogation (BP), architecture, learning in fuzzy BP, inference by fuzzy BP, applications.

Text Books:

1. Kumar Satish, “Neural Networks” Tata Mc Graw Hill
2. S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications” Prentice Hall of India.

Reference Books:

3. Siman Haykin, “Neural Netowrks” Prentice Hall of India
4. Timothy J. Ross, “Fuzzy Logic with Engineering Applications” Wiley India.

NEE - 014: POWER THEFT AND ENERGY MANAGEMENT

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3 1 0

UNIT-I

Introduction: Energy sources, Energy demand and supply, Energy crisis, Future scenario,

Menace of power theft, reasons for power pilferage, electricity loss and theft-National and Global scenario, Security seals and tampering, harmonics and power theft, Control Over power theft.

UNIT-II

Power Theft in Electro-mechanical Meters: Power theft in Voltage circuit, by-passing meters, drilling holes on Electro-mechanical Meters, Insertion of film into meter, partial earth fault tampering, Missing Neutral Method.

Power Theft in Electronic Meters:

Power theft by means of Electrostatic Discharge, by tampering printed circuit board, by tampering the frequency circuit, tampering on display circuits of energy meter, Introducing limit switch.

UNIT-III

Energy system efficiency, Energy conservation aspects, Instrumentation and measurements.

Principles of Energy Management and Energy Audit: General principles, Planning and program, Introduction to energy audit, General methodology, Site surveys, Energy systems survey, Energy audit, Instrumentation, Analysis of data and results.

UNIT-IV

Electrical Load and Lighting Management: General principles, Illumination and human comfort, Lighting systems, Equipment's, Electrical systems, Electrical load analysis, Peak load controls.

Demand Side Management: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy ,Planning, Implementation and its application. Customer Acceptance & its implementation issues. National and International Experiences with DSM

Text Books:

1. G.Sreenivasan, “Power Theft”, PHI Learning Private Limited
2. Amlan Chakrabarti, “Energy Engineering and Management ”, PHI Learning Private Limited
3. W R Murphy, G Mckay, ‘Energy Management’ B.S. Publications.

DEPARTMENTAL ELECTIVES
ELECTIVE – II

NEE – 021: HIGH VOLTAGE ENGINEERING

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UNIT-I

Break Down In Gases:
Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, breakdown in vacuum.

Break Down In Liquid Dielectrics:
Classification of liquid dielectric, characteristic of liquid dielectric, breakdown in pure liquid and commercial liquid.

Break Down In Solid Dielectrics:
Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric in practice, breakdown in composite dielectrics.

UNIT-II

Generation of High Voltages and Currents:
Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of High Voltages and Currents:
Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

UNIT-IV

Non-Destructive Testing:
Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:
Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Book:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, McGraw Hill Education (India) Private Limited.

Reference Books:

2. E. Kuffel and W. S. Zacngal, High Voltage Engineering", Pergamon Press.
3. R. S. Jha, "High Voltage Engineering", Dhanpat Rai & sons
4. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.
5. M. Khalifa,' High Voltage Engineering Theory and Practice,' Marcel Dekker.
6. Subir Ray,' An Introduction to High Voltage Engineering' Prentice Hall of India

NEE -022: INTELLIGENT INSTRUMENTATION

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Unit – 1& 2

1. **Introduction: Introduction to Intelligent Instrumentation:**
   Historical Perspective, current status, software based instruments.
2. **Virtual Instrumentation:**
   Introduction to graphical programming, data flow & graphical programming techniques, advantage of VI techniques, VIs and sub-VIs loops and charts , arrays, clusters and graphs, case and sequence structures, formula nodes, string and file I/O, Code Interface Nodes and DLL links.

Unit-3

3. Data Acquisition Methods: Analog and Digital IO, Counters, Timers, basic ADC designs, interfacing methods of DAQ hardware, software structure, use of simple and intermediate VIs. Use of Data Sockets for Networked Communication and Controls.

Unit-4

4. PC Hardware Review & Instrumentation Buses: Structure, timing, interrupts, DMA, operating system, ISA, PCI, USB, PCMCIA buses. IEEE488.1 & 488.2 Serial Interfacing - RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI.

References:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall.
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall.
3. H. S. kalsi, “Electronic Instrumentation”, McGraw Hill Education (India) Private Limited.
4. S. Gupta , J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED./ Instrument Society of America, 1994.
5. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill.

NEE -023: CONVENTIONAL & CAD OF ELECTRICAL MACHINES

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UNIT-I

Basic Considerations:
Basic concept of design, limitation in design, standardization, modern trends in design and manufacturing techniques, Classification of insulating materials.
Calculation of total mmf and magnetizing current. Transformer Design:
Output equation design of core, yoke and windings, overall dimensions,
Computation of no load current to voltage regulation, efficiency and cooling system designs

UNIT-II
Design of rotating machines – I:
Output equations of rotating machines, specific electric and magnetic loadings, factors affecting size of rotating machines, separation of main dimensions, selection of frame size.
Core and armature design of dc and 3-phase ac machines
UNIT-III
Design of rotating machines – II:
Rotor design of three phase induction motors.
Design of field system of DC machine and synchronous machines. Estimation of performance from design data.
UNIT-IV
Computer Aided Design
Philosophy of computer aided design, advantages and limitations. Computer aided design approaches analysis, synthesis and hybrid methods. Concept of optimization and its general procedure.
Flow charts and 'c' based computer programs for the design of transformer, dc machine, three phase induction and synchronous machines.
Text Books:
1. K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. K.G. Upadhyay," Conventional and Computer Aided Design of Electrical Machines" Galgotia Publications.
Reference Books:
3. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
4. A.E. Clayton and N.N. Hancock, "The Performance and Design of D.C.Machines" Pitman & Sons.
5. S.K. Sen, "Principle of Electrical Machine Design with Computer Programming" Oxford and IBM Publications.

NEE -024: SMART ENERGY DELIVERY SYSTEMS

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UNIT I

Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid. CDM opportunities in Smart Grid.

UNIT II

Smart Grid Technologies: Part 1: Introduction to Smart Meters, Real Time Prizing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers.

UNIT III

Smart Grid Technologies: Part 2: Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).

UNIT IV

Microgrids and Distributed Energy Resources: Concept of microgrid, need & applications of microgrid, formation of microgrid, Issues of interconnection, protection & control of microgrid. Plastic & Organic solar cells, thin film solar cells, Variable speed wind generators, fuelcells, microturbines, Captive power plants, Integration of renewable energy sources.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai "Integration of Green and Renewable Energy in Electric Power Systems", Wiley
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press
3. Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley
4. Jean Claude Sabonnadière, Nouredine Hadjsaïd, "Smart Grids", Wiley Blackwell 19
5. Stuart Borlase, "Smart Grids (Power Engineering)", CRC Press

Reference Books:

1. Andres Carvallo, John Cooper, "The Advanced Smart Grid: Edge Power Driving Sustainability: ", Artech House Publishers July 2011
2. James Northcote, Green, Robert G. Wilson "Control and Automation of Electric Power Distribution Systems (Power Engineering)", CRC Press
3. Mladen Kezunovic, Mark G. Adamiak, Alexander P. Apostolov, Jeffrey George Gilbert "Substation Automation (Power Electronics and Power Systems)", Springer
4. R. C. Dugan, Mark F. McGranghan, Surya Santoso, H. Wayne Beaty, "Electrical Power System Quality", 2nd Edition, McGraw Hill Publication

NEE – 651: POWER SYSTEM LAB

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Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based:

1. To determine direct axis reactance (x_d) and quadrature axis reactance (x_q) of a salient pole alternator.
2. To determine negative and zero sequence reactances of an alternator.
3. To determine sub transient direct axis reactance (x_d) and sub transient quadrature axis reactance (x_q) of an alternator
4. To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5. To study the IDMT over current relay and determine the time current characteristics
6. To study percentage differential relay
7. To study Impedance, MHO and Reactance type distance relays
8. To determine location of fault in a cable using cable fault locator
9. To study ferranty effect and voltage distribution in H.V. long transmission line using transmission line model.
10. To study operation of oil testing set.

Simulation Based Experiments (using MATLAB or any other software)

11. To determine transmission line performance.
12. To obtain steady state, transient and sub-transient short circuit currents in an alternator
13. To obtain formation of Y-bus and perform load flow analysis
14. To perform symmetrical fault analysis in a power system
15. To perform unsymmetrical fault analysis in a power system

Text Books:-

1. Hasdi Sadat, “Power System Analysis” Tata Mc.Graw Hill.
2. T. K. Nagsarskar & M.S. Sukhija,’ Power System Analysis’ Oxford Universitry Press.

NEE=652: ELECTRICAL CAD LAB

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1. Design of Single phase transformer.
2. Design of Three phase transformer.
3. Design of Single phase Induction Motor.
4. Design of Three phases Induction Motor.
5. Design of DC motor.
6. Design of DC generator.
7. Design of Single phase alternator.
8. Design of three phase alternator.
9. Design of Synchronous Motor.
10. Design of lag, lead and lag-lead compensator.

Text Books:-

1. A.K. Sawhney, "A Course in Electrical Machine Design" Dhanpat Rai & Sons.
2. M.G. Say, "The Performance and Design of AC Machines" Pitman & Sons.
3. D.P. Kothari & I J Nagrath, "Electric Machine", McGraw Hill Education (India) Private Limited, Sigma Series.
4. S.K. Bhattacharya, "Electrical Machine", McGraw Hill Education (India) Private Limited.
5. Bhag S, Guru and Huseyin R.Hiziroglu, " Electric machinery and Transformers", Oxford University Press.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

Evaluation Scheme & Syllabus

For

B. Tech. Third Year

(Computer Science and Engineering)

(Computer Science and Information Technology)

On

Choice Based Credit System

(Effective from the Session: 2018-19)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW

B. Tech. (CSE\CSIT)

FIFTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS501	MANEGERIAL ECONOMICS	3---0---0	70	20	10	100	3
2	RAS502/ RUC501	INDUSTRIAL SOCIOOLOGY /CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-501	Database Management Systems	3---0---0	70	20	10	100	3
4	RCS-502	Design and Analysis of Algorithm	3---1---0	70	20	10	100	4
5	RCS-503	Principles of Programming Languages	3---0---0	70	20	10	100	3
6	CS-Elective-1	DEPTT ELECTIVE COURSE-1	3---1---0	70	20	10	100	4
7	RCS-551	Database Management Systems Lab	0---0---2	50	-	50	100	1
8	RCS-552	Design and Analysis of Algorithm Lab	0---0---2	50	-	50	100	1
9	RCS-553	Principles of Programming Languages Lab	0---0---2	50	-	50	100	1
10	RCS-554	Web Technologies Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

SIXTH SEMESTER

Sl No.	Subject Code	Subject Name	L-T-P	Theory/ Lab (ESE) Marks	Sessional		Total	Credit
					Test	Assign/Att.		
1	RAS601	INDUSTRIAL MANAGEMENT	3---0---0	70	20	10	100	3
2	RAS602 / RUC601	INDUSTRIAL SOCIOLOGY/ CYBER SECURITY	3---0---0	70	20	10	100	3
3	RCS-601	Computer Networks	3---0---0	70	20	10	100	3
4	RCS-602	Compiler Design	3---1---0	70	20	10	100	4
5	RCS-603	Computer Graphics	3---0---0	70	20	10	100	3
6	CS-Elective-2	DEPTT ELECTIVE COURSE-2	3---1---0	70	20	10	100	4
7	RCS-651	Computer Networks Lab	0---0---2	50	-	50	100	1
8	RCS-652	Compiler Design Lab	0---0---2	50	-	50	100	1
9	RCS-653	Computer Graphics Lab	0---0---2	50	-	50	100	1
10	RCS-654	Data Warehousing & Data Mining Lab	0---0---2	50	-	50	100	1
	TOTAL						**1000**	**24**

DEPARTMENTAL ELECTIVES

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT

RIT-052: SOFTWARE TESTING & AUDIT

RCS-051: OPERATION RESEARCH

RCS-052: WEB TECHNOLOGIES

CS-ELECTIVE-2: Computer Science Departmental Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS

RIT-062: DATAWAREHOUSING & DATA MINING

RCS-061: INTERNET OF THINGS

RCS-062: NEURAL NETWORK

B. Tech. (CSE\CSIT)
FIFTH EMESTER (DETAILED SYLLABUS)

RCS-501:Database Management Systems		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Overview, Database System vs File System, Database System Concept and Architecture, Data Model Schema and Instances, Data Independence and Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. Data Modeling Using the Entity Relationship Model: ER Model Concepts, Notation for ER Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.	**08**
II	**Relational data Model and Language:** Relational Data Model Concepts, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. Introduction on SQL: Characteristics of SQL, Advantage of SQL. SQl Data Type and Literals. Types of SQL Commands. SQL Operators and Their Procedure. Tables, Views and Indexes. Queries and Sub Queries. Aggregate Functions. Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL	**08**
III	**Data Base Design & Normalization:** Functional dependencies, normal forms, first, second, 8 third normal forms, BCNF, inclusion dependence, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design	**08**
IV	**Transaction Processing Concept:** Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. Distributed Database: Distributed Data Storage, Concurrency Control, Directory System.	**08**
V	**Concurrency Control Techniques:** Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction, Case Study of Oracle.	**08**

References:

1. Korth, Silbertz, Sudarshan,” Database Concepts”, McGraw Hill
2. Date C J, “An Introduction to Database Systems”, Addision Wesley
3. Elmasri, Navathe, “ Fundamentals of Database Systems”, Addision Wesley
4. O’Neil, Databases, Elsevier Pub.
5. RAMAKRISHNAN"Database Management Systems",McGraw Hill
6. Leon & Leon,”Database Management Systems”, Vikas Publishing House
7. Bipin C. Desai, “ An Introduction to Database Systems”, Gagotia Publications
8. Majumdar & Bhattacharya, “Database Management System”, TMH
9. R.P. Mahapatra, Database Management System, Khanna Publishing House

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-502: Design and Analysis of Algorithm		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Algorithms, Analyzing Algorithms, Complexity of Algorithms, Growth of Functions, Performance Measurements, Sorting and Order Statistics - Shell Sort, Quick Sort, Merge Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.	**08**
II	**Advanced Data Structures:** Red-Black Trees, B – Trees, Binomial Heaps, Fibonacci Heaps, Tries, Skip List	**08**
III	**Divide and Conquer** with Examples Such as Sorting, Matrix Multiplication, Convex Hull and Searching. **Greedy Methods** with Examples Such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's Algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford Algorithms.	**08**
IV	**Dynamic Programming** with Examples Such as Knapsack. All Pair Shortest Paths – Warshal's and Floyd's Algorithms, Resource Allocation Problem. Backtracking, Branch and Bound with Examples Such as Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.	**08**
V	**Selected Topics:** Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-Completeness, Approximation Algorithms and Randomized Algorithms	**08**

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
3. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.
4. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill
5. Gajendra Sharma, Design & Analysis of Algorithms, Khanna Publishing House
6. Richard E.Neapolitan "Foundations of Algorithms" Jones & Bartlett Learning
7. Jon Kleinberg and Éva Tardos, Algorithm Design, Pearson, 2005.
8. Michael T Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Second Edition, Wiley, 2006.
9. Harry R. Lewis and Larry Denenberg, Data Structures and Their Algorithms, Harper Collins, 1997
10. Robert Sedgewick and Kevin Wayne, Algorithms, fourth edition, Addison Wesley, 2011.
11. Harsh Bhasin,"Algorithm Design and Analysis",First Edition,Oxford University Press.
12. Gilles Brassard and Paul Bratley,Algorithmics:Theory and Practice,Prentice Hall,1995.

RCS-503: Principles of Programming Languages		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Role of Programming Languages: Why Programming Languages, Towards Higher-Level Languages, Programming Paradigms, Programming Environments Language Description: Syntactic Structure, Language Translation Issues: Programming Language Syntax, Stages in Translation, Formal Translation Models	**08**
II	**Data, Data Types, and Basic Statements** : Names , Variables , Binding, Type Checking, Scope, Scope Rules , Lifetime and Garbage Collection, Primitive Data Types, Strings, Array Types, Associative Arrays ,Record Types, Union Types, Pointers and References , Arithmetic Expressions , Overloaded Operators, Type Conversions , Relational and Boolean Expressions, Assignment Statements, Mixed Mode Assignments, Control Structures, Selection ,Iterations, Branching, Guarded Statements	**08**
III	**Subprograms and Implementations** : Subprograms, Design Issues, Local Referencing, Parameter Passing, Overloaded Methods, Generic Methods, Design Issues for Functions , Semantics of Call and Return, Implementing Simple Subprograms, Stack and Dynamic Local Variables, Nested Subprograms, Dynamic Scoping.	**08**
IV	**Object-Orientation, Concurrency, and Event Handling** : Grouping of Data and Operations — Constructs for Programming Structures, Abstraction Information Hiding, Program Design with Modules, Defined Types, Object Oriented Programming — Concept of Object, Inheritance, Derived Classes and Information Hiding – Templates, Semaphores, Monitors, Message Passing, Threads, Statement Level Concurrency Exception Handling (Using C++ and Java as Example Language).	**08**
V	**Functional and Logic Programming Languages** : Introduction to Lambda Calculus , Fundamentals of Functional Programming Languages, Programming with Programming with ML, Introduction to Logic and Logic Programming – Programming with Prolog.	**08**

References:

1. "Programming Languages: Design and Implementations" , Terrance W.Pratt, Marvin V. Zelkowitz, T.V.Gopal, Fourth ed., Prentice Hall
2. "Programming Language Design Concept", David A. Watt, Willey India
3. "Programming languages: Concepts and Constucts", Ravi Sethi, Second Ed.,Pearson.
4. "Types and programming Languages", Benjamin C. Pierce. The MIT Press Cambridge, Massachusetts London, England
5. Concepts of Programming Languages, Robert W. Sebesta, 10th Ed.,Pearson

CS-ELECTIVE -1: Computer Science and Engineering Elective-1

RIT-051: SOFTWARE PROJECT MANAGEMENT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Software Project Planning**: Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope Document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project Plan, Structure of a Software Project Management Plan, Software Project Estimation, Estimation Methods, Estimation Models, Decision Process.	**08**
II	**Project Organization and Scheduling Project Elements:** Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts	**08**
III	**Project Monitoring and Control:** Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.	**08**
IV	**Software Quality Assurance and Testing Objectives**: Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & Validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of Correctness, Statistical Quality Assurance, Cleanroom Process.	**08**
V	**Project Management and Project Management Tools Software Configuration Management:** Software Configuration Items and Tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and Risk Types, Risk Breakdown Structure (RBS), Risk Management Process: Risk Identification, Risk Analysis, Risk Planning, Risk Monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.	**08**

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.
7. P.K. Agarwal, SAM R., Software Project Management, Khanna Publishing House

RIT-052: SOFTWARE TESTING & AUDIT		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Review of Software Engineering**: Overview of Software Evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference Between Verification and Validation, Test Cases, Testing Suite, Test ,Oracles, Impracticality of Testing All Data; Impracticality of Testing AllPaths. **Verification:** Verification Methods, SRS Verification, Source Code Reviews, User Documentation Verification, Software, Project Audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection and Configuration Audits.	**08**
II	**Functional Testing:** Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique. **Structural Testing**: Control Flow Testing, Path Testing, Independent Paths, Generation of Graph from Program, Identification of Independent Paths, Cyclomatic Complexity, Data Flow Testing, Mutation Testing	**08**
III	**Regression Testing:** What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique. **Reducing the number of test cases**: Prioritization guidelines, Priority category, Scheme, Risk Analysis.	**08**
IV	**Software Testing Activities:** Levels of Testing, Debugging, Testing techniques and their applicability, Exploratory Testing **Automated Test Data Generation:** Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.	**08**
V	**Object Oriented Testing:** Definition, Issues, Class Testing, Object Oriented Integration and System Testing. **Testing Web Applications:** Web Testing, User Interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing.	**08**

References:

1 Yogesh Singh, "Software Testing", Cambridge University Press, New York, 2012

2. K..K. Aggarwal & Yogesh Singh, "Software Engineering", New Age International Publishers, New Delhi, 2003.

3. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Fifth Edition, McGraw-Hill International Edition, New Delhi, 2001.

4. Marc Roper, "Software Testing", McGraw-Hill Book Co., London, 1994.

5. M.C. Trivedi, Software Testing & Audit, Khanna Publishing House

6. Boris Beizer, "Software System Testing and Quality Assurance", Van Nostrand Reinhold, New York, 1984.

RCS-051: OPERATION RESEARCH		3-0-0
Uni t	**Topic**	**Proposed Lecture**
I	Definition and Scope of Operations Research (OR), OR Model, Solving the OR Model, Art of Modelling, Phases of OR Study. Linear Programming: Two Variable Linear Programming Model and Graphical Method of Solution, Simplex Method, Dual Simplex Method, Special Cases of Linear Programming, Duality, Sensitivity Analysis.	**08**
II	Transportation Problems: Types of Transportation Problems, Mathematical Models, Transportation Algorithms, Assignment: Allocation and Assignment Problems and Models, Processing of Job through Machines.	**08**
III	Network Techniques: Shortest Path Model, Minimum Spanning Tree Problem, Max-Flow Problem and Min-Cost Problem. Project Management: Phases of Project Management, Guidelines for Network Construction, CPM and PERT.	**08**
IV	Theory of Games : Rectangular Games, Minimax Theorem, Graphical Solution of 2 x n or m x 2 Games, Game with Mixed Strategies, Reduction to Linear Programming Model. Quality Systems: Elements of Queuing Model, Generalized Poisson Queuing Model, Single Server Models.	**08**
V	Control: Models of Inventory, Operation of Inventory System, Quantity Discount. Replacement Models: Equipment's that Deteriorate with Time, Equipment's that Fail with Time.	**08**

References:

1. Wayne L. Winston, "Operations Research" Thomson Learning, 2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education, 2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.
5. T.Veerarajan "Operation Research" Universities Press

RCS-052: WEB TECHNOLOGIES		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction:** Introduction and Web Development Strategies, History of Web and Internet, Protocols Governing Web, Writing Web Projects, Connecting to Internet, Introduction to Internet services and tools, Introduction to client-server computing. Core Java: Introduction, Operator, Data type, Variable, Arrays, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Event handling, Introduction to AWT, AWT controls, Layout managers	**08**
II	**Web Page Designing:** HTML: List, Table, Images, Frames, forms, CSS, Document type definition, XML: DTD, XML schemes, Object Models, presenting and using XML, Using XML Processors: DOM and SAX, Dynamic HTML	**08**
III	**Scripting:** Java script: Introduction, documents, forms, statements, functions, objects; introduction to AJAX, **Networking** **:** Internet Addressing, InetAddress, Factory Methods, Instance Methods, TCP/IP Client Sockets, URL, URL Connection, TCP/IP Server Sockets, Datagram.	**08**
IV	**Enterprise Java Bean:** Preparing a Class to be a JavaBeans, Creating a JavaBeans, JavaBeans Properties, Types of beans, Stateful Session bean, Stateless Session bean, Entity bean **Java Database Connectivity (JDBC):** Merging Data from Multiple Tables: Joining, Manipul ating, Databases with JDBC, Prepared Statements, Transaction Processing, Stored Procedures.	**08**
V	**Servlets:** Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, H andling HTTP get Requests, Handling HTTP post Requests, Redirecting Requests to Other Resource s, Session Tracking, Cookies, Session Tracking with Http Session **Java Server Pages (JSP):** Introduction, Java Server Pages Overview, A First Java Server Page Example, Implicit Objects, Scripting, Standard Actions, Directives, Custom Tag Libraries..	**08**

References:

1. Burdman, Jessica, “Collaborative Web Development” Addison Wesley
2. Xavier, C, “ Web Technology and Design” , New Age International
3. Ivan Bayross,” HTML, DHTML, Java Script, Perl & CGI”, BPB Publication
4. Tanveer Alam, Internet & Java Programming, Khanna Publishing House
5. Bhave, “Programming with Java”, Pearson Education
6. Herbert Schieldt, “The Complete Reference:Java”, TMH.
7. Hans Bergsten, “Java Server Pages”, SPD O’Reilly
8. Margaret Levine Young, “The Complete Reference Internet”, TMH
9. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
10. Balagurusamy E, “Programming in JAVA”, TMH

RCS-551 Database Management Systems Lab

Objectives :

1. Installing oracle/ MYSQL
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE /MYSQL:
   a)Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c)Displaying data from multiple tables.
   d)Aggregating data using group function.
   e)Manipulating data.
   e)Creating and managing tables.
4. Normalization
5. Creating cursor
6. Creating procedure and functions
7. Creating packages and triggers
8. Design and implementation of payroll processing system
9. Design and implementation of Library Information System
10. Design and implementation of Student Information System
11. Automatic Backup of Files and Recovery of Files

RCS-552 Design and Analysis of Algorithm Lab

Objective:-

1. Program for Recursive Binary & Linear Search.
2. Program for Heap Sort.
3. Program for Merge Sort.
4. Program for Selection Sort.
5. Program for Insertion Sort.
6. Program for Quick Sort.
7. Knapsack Problem using Greedy Solution
8. Perform Travelling Salesman Problem
9. Find Minimum Spanning Tree using Kruskal's Algorithm
10. Implement N Queen Problem using Backtracking

RCS-553 Principles of Programming Languages Lab

Objective:-

1. Program for linear search in ML
2. Program for binary search in ML
3. Program for insertion sort in ML
4. Program for bubble sort in ML
5. Program for merge sort in ML
6. Program for Quick sort in ML
7. Program for making a dictionary in ML
8. Program for merging two unsorted-students-name-list in sorted order

9. Course on 'PHP & MySQL', Spoken Tutorial MOOC

RCS-554 Web Technologies Lab

This lab is based on the Web Technologies. Some examples are as follows:

1. Write HTML/Java scripts to display your CV in navigator, your Institute website, Department Website and Tutorial website for specific subject
2. Write an HTML program to design an entry form of student details and send it to store at database server like SQL, Oracle or MS Access.
3. Write programs using Java script for Web Page to display browsers information.
5. Write a Java applet to display the Application Program screen i.e. calculator and other.
6. Writing program in XML for creation of DTD, which specifies set of rules. Create a style sheet in CSS/ XSL & display the document in internet explorer.
7. Program to illustrate JDBC connectivity. Program for maintaining database by sending queries. Design and implement a simple servlet book query with the help of JDBC & SQL. Create MS Access Database, Create on ODBC link, Compile & execute JAVA JDVC Socket.
8. Install TOMCAT web server and APACHE. Access the above developed static web pages for books web site, using these servers by putting the web pages developed .
9. Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. Create a Cookie and add these four user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form and authenticate with the values available in the cookies.
10. Install a database (Mysql or Oracle). Create a table which should contain at least the following fields: name, password, email-id, phone number Write a java program/servlet/JSP to connect to that database and extract data from the tables and display them. Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.
11. Write a JSP which insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database
12. Design and implement a simple shopping cart example with session tracking API.

B. Tech. (CSE\CSIT)
SIXTH EMESTER (DETAILED SYLLABUS)

RCS-601: COMPUTER NETWORKS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction Concepts:** Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling	**08**
II	**Medium Access sub layer:** Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.	**08**
III	**Network Layer:** Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.	**08**
IV	**Transport Layer**: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.	**08**
V	**Application Layer:** Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks	**08**

REFRENCES:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Bhavneet Sidhu, An Integrated approach to Computer Networks, Khanna Publishing House
5. .Gary R.Wright,W.Richard Stevens "TCP/IP Illustrated,Volume2 The Implementation" Addison-Wesley
6. Michael A. Gallo and William M. Hancock "Computer communucation and Networking Technology" Cengage Learning
7. Anuranjan Misra, “Computer Networks”, Acme Learning
8. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

RCS-602: COMPILER DESIGN		3-1-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction to Compiler**: Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.	**08**
II	**Basic Parsing Techniques:** Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.	**08**
III	**Syntax-directed Translation:** Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.	**08**
IV	**Symbol Tables**: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.	**08**
V	**Code Generation:** Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator. Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.	**08**

REFRENCES:

1. K. Muneeswaran,Compiler Design,First Edition,Oxford University Press.
2. J.P. Bennet, “Introduction to Compiler Techniques”, Second Edition, Tata McGraw-Hill,2003.
3. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI, 2001.
4. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
5. V Raghvan, “ Principles of Compiler Design”, TMH
6. Kenneth Louden,” Compiler Construction”, Cengage Learning.
7. Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education

RCS-603: COMPUTER GRAPHICS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Introduction and Line Generation:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid-point circle generating algorithm, and parallel version of these algorithms.	**08**
II	**Transformations:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing. **Windowing and Clipping:** Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping	**08**
III	**Three Dimensional:** 3-D Geometric Primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.	**08**
IV	**Curves and Surfaces:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.	**08**
V	**Hidden Lines and Surfaces:** Back Face Detection algorithm, Depth buffer method, A-buffer method, Scan line method, basic illumination models– Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.	**08**

REFRENCES:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Foley, Vandam, Feiner, Hughes – “Computer Graphics principle”, Pearson Education.
3. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill
4. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – Tata MCGraw Hill.
5. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, Tata MCGraw Hill.
6. R.K. Maurya, “Computer Graphics ” Wiley Dreamtech Publication.
7. M.C. Trivedi, NN Jani, Computer Graphics & Animations, Jaico Publications
8 Rishabh Anand, Computer Graphics- A practical Approach, Khanna Publishing House
9. Mukherjee, Fundamentals of Computer graphics & Multimedia, PHI Learning Private Limited.
10. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education

CS-ELECTIVE -2: Computer Science and Engineering Elective-2

RIT-061: DESIGN AND DEVELOPMENT OF APPLICATIONS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**INTRODUCTION:** Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications	**08**
II	**BASIC DESIGN:** Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.	**08**
III	**ADVANCED DESIGN:** Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.	**08**
IV	**TECHNOLOGY I – ANDROID:** Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wi-Fi – Integration with social media applications.	**08**
V	**TECHNOLOGY II – iOS:** Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wi-Fi - iPhone marketplace. Swift: Introduction to Swift, features of swift.	**08**

REFRENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore, apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS
6. Development: Exploring the iOS SDK”, Apress, 2013.

RIT-062: DATAWAREHOUSING & DATA MINING		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Data Warehousing:** Overview, Definition, Data Warehousing Components, Building a Data Warehouse, Warehouse Database, Mapping the Data Warehouse to a Multiprocessor Architecture, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept	**08**
II	**Data Warehouse Process and Technology:** Warehousing Strategy, Warehouse /management and Support Processes, Warehouse Planning and Implementation, Hardware and Operating Systems for Data Warehousing, Client/Server Computing Model & Data Warehousing. Parallel Processors & Cluster Systems, Distributed DBMS implementations, Warehousing Software, Warehouse Schema Design,	**08**
III	**Data Mining:** Overview, Motivation, Definition & Functionalities, Data Processing, Form of Data Pre-processing, Data Cleaning: Missing Values, Noisy Data, (Binning, Clustering, Regression, Computer and Human inspection), Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data Compression, Numerosity Reduction, Discretization and Concept hierarchy generation, Decision Tree.	**08**
IV	**Classification**: Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisons, Statistical measures in large Databases, Statistical-Based Algorithms, Distance-Based Algorithms, Decision Tree-Based Algorithms. Clustering: Introduction, Similarity and Distance Measures, Hierarchical and Partitional Algorithms. Hierarchical Clustering- CURE and Chameleon. Density Based Methods-DBSCAN, OPTICS. Grid Based Methods- STING, CLIQUE. Model Based Method – Statistical Approach, Association rules: Introduction, Large Item sets, Basic Algorithms, Parallel and Distributed Algorithms, Neural Network approach.	**08**
V	**Data Visualization and Overall Perspective:** Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse. Warehousing applications and Recent Trends: Types of Warehousing Applications, Web Mining, Spatial Mining and Temporal Mining	**08**

REFRENCES:

1. Alex Berson, Stephen J. Smith "Data Warehousing, Data-Mining & OLAP", TMH
2. Mark Humphries, Michael W. Hawkins, Michelle C. Dy, " Data Warehousing: Architecture and Implementation", Pearson
3. I. Singh, Data Mining and Warehousing, Khanna Publishing House
4. Margaret H. Dunham, S. Sridhar,"Data Mining:Introductory and Advanced Topics" Pearson Education
5. Arun K. Pujari, "Data Mining Techniques" Universities Press
6. Pieter Adriaans, Dolf Zantinge, "Data-Mining", Pearson Education

RCS-061: INTERNET OF THINGS		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples . **Design Principles for Connected Devices:** IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and affordability.	**08**
II	**Hardware for IoT:** Sensors, digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	**08**
III	**Network & Communication Aspects in IoT:** Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	**08**
IV	**Programming the Ardunio:** Ardunio platform boards anatomy, ardunio IDE, coding, using emulator, using libraries, additions in ardunio, programming the ardunio for IoT.	**08**
V	**Challenges in IoT Design Challenges**: Development challenges, Security challenges, Other challenges **IoT Applications** : Smart metering, e-health, city automation, automotive applications, home automation, smart cards, Communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	**08**

References:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi“The Internet of Things key applications and protocols”, willey
2. Jeeva Jose, Internet of Things, Khanna Publicatiosn
3. Michael Miller “The Internet of Things” by Pearson
4. Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti “ Internet of Things(A hands on approach)” 1ST edition, VPI publications,2014
6. Adrian McEwen,HakinCassimally “Designing the Internet of Things” Wiley India

RCS-062: NEURAL NETWORK		3-0-0
Unit	**Topic**	**Proposed Lecture**
I	**Neuro Computing and Neuroscience**: Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.	**08**
II	**Data Processing Scaling:** Normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, Eigen values & Eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perception, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.	**08**
III	**Multilayered Network Architecture:** Back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.	**08**
IV	**Recurrent Network and Temporal Feed-Forward Network:** Implementation with BP, self-Organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing	**08**
V	**Complex Valued NN and Complex Valued BP:** Analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration	**08**

REFRENCES:

1. 1.J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Munesh Chandra Trivedi, NN Jani, Artificial Neural Network Technology, Khanna Publishing House
5. Kosko, Neural Network and Fuzzy Sets, PHI 5. Hagan, Neural Network Design w/CD,Cengage Learning

RCS-651: COMPUTER NETWORKS LAB

1. To learn handling and configuration of networking hardware like RJ-45 connector, CAT-6 cable, crimping tool, etc.
2. Configuration of router, hub, switch etc. (using real devices or simulators)
3. Running and using services/commands like ping, trace route, nslookup, arp, telnet, ftp, etc.
4. Network packet analysis using tools like Wireshark, tcpdump, etc.
5. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
6. Socket programming using UDP and TCP (e.g., simple DNS, data & time client/server, echo client/server, iterative & concurrent servers)
7. Programming using raw sockets
8. Programming using RPC

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-652: COMPILER DESIGN LAB

1. Implementation of LEXICAL ANALYZER for IF STATEMENT
2. Implementation of LEXICAL ANALYZER for ARITHMETIC EXPRESSION
3. Construction of NFA from REGULAR EXPRESSION
4. Construction of DFA from NFA
5. Implementation of SHIFT REDUCE PARSING ALGORITHM
6. Implementation of OPERATOR PRECEDENCE PARSER
7. Implementation of RECURSIVE DESCENT PARSER
8. Implementation of CODE OPTIMIZATION TECHNIQUES
9. Implementation of CODE GENERATOR

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-653: COMPUTER GRAPHICS LAB

1. To implement DDA algorithms for line and circle.
2. To implement Bresenham's algorithms for line, circle and ellipse drawing
3. To implement Mid Point Circle algorithm using C .
4. To implement Mid Point Ellipse algorithm using C .
5. To perform 2D Transformations such as translation, rotation, scaling, reflection and sharing.
6. To implement Cohen–Sutherland 2D clipping and window–viewport mapping.
7. To implement Liang Barksy Line Clipping Algorithm.
8. To perform 3D Transformations such as translation, rotation and scaling.
9. To convert between color models.
10. To perform animation using any Animation software
11. To perform basic operations on image using any image editing software
12. To draw different shapes such as hut, face, kite, fish etc.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCS-654: Data Warehousing & Data Mining Lab

It is expected that student should implement concept of Data Mining and Warehousing. The open source Data Mining Tools like Rapid Miner, Weka etc. can be used to implement the concept of Data Mining and Warehousing. Some examples are as follows (Subject Teacher may add more):

1. Implementation of OLAP operations
2. Implementation of Varying Arrays
3. Implementation of Nested Tables
4. Demonstration of any ETL tool
5. Write a program of Apriori algorithm using any programming language.
6. Create data-set in .arff file format. Demonstration of preprocessing on WEKA data-set.
7. Demonstration of Association rule process on data-set contact lenses.arff /supermarket (or any other data set) using apriori algorithm.
8. Demonstration of classification rule process on WEKA data-set using j48 algorithm.
9. Demonstration of classification rule process on WEKA data-set using Naive Bayes algorithm.
10. Demonstration of clustering rule process on data-set iris.arff using simple k-means.

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS FOR

B. TECH. III YEAR

ELECTRICAL ENGINEERING /
ELECTRICAL & ELECTRONICS ENGINEERING

ON

CHOICE BASED CREDIT SYSTEM (CBCS)

[Effective from the Session: 2018-19]

EVALUATION SCHEME

B-TECH. ELECTRICAL ENGINEERING
B-TECH. ELECTRICAL & ELECTRONICS ENGINEERING

YEAR 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Th./Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1	RAS501	MANAGERIAL ECONOMICS	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	SOCIOLOGY /CYBER SECURITY	Applied Science	3--0--0	70	20	10	100	3
3	REE501	ELECTRICAL MACHINES -II	Core Deptt.	3--0--0	70	20	10	100	3
4	REE502	POWER TRANSMISSION & DISTIBUTION	Core Deptt.	3--1--0	70	20	10	100	4
5	REE503	CONTROL SYSTEM	Core Deptt.	3--0--0	70	20	10	100	3
6	REE051 -054	DEPTT ELECTIVE COURSE-1	Core Deptt.	3--1--0	70	20	10	100	4
7	REE551	ELECTRICAL MACHINES –II LAB	Core Deptt.	0--0--2	50		50	100	1
8	REE553	CONTROL SYSTEM LAB	Core Deptt.	0--0--2	50		50	100	1
9	REE554	SOFTWARE BASED POWER SYSTEM LAB	Core Deptt.	0--0--2	50		50	100	1
10	REE555	SEMINAR – I		0--0--2	50		50	100	1
	TOTAL				620	120	260	1000	24

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DEPTT. ELECTIVE COURSE-1

1.. **REE051:Power System Optimization**
2.. **REE052: Principles of Communication**
3.. **REE053:Fundamentals of Digital Signal Processing**
4.. **REE054: Internet of Things**

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EVALUATION SCHEME

B-TECH. ELECTRICAL ENGINEERING
B-TECH. ELECTRICAL & ELECTRONICS ENGINEERING

YEAR 3rd / SEMESTER-VI

S. No.	Subject Code	Subject Name	Department	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1	RAS601	INDUSTRIAL MANAGEMENT	Applied Science	3--0--0	70	20	10	100	3
2	RAS602 / RUC601	SOCIOLOGY /CYBER SECURITY	Applied Science	3--0--0	70	20	10	100	3
3	REE601	POWER ELECTRONICS	Core Deptt.	3--0--0	70	20	10	100	3
4	REE602	MICROPROCESSOR	Core Deptt.	3--1--0	70	20	10	100	4
5	REE603	POWER SYSTEM ANALYSIS	Core Deptt.	3--0--0	70	20	10	100	3
6	REE061 -064	DEPTT ELECTIVE COURSE-2	Core Deptt.	3--1--0	70	20	10	100	4
7	REE661	POWER ELECTRONICS LAB	Core Deptt.	0--0--2	50		50	100	1
8	REE662	MICROPROCESSOR LAB	Core Deptt.	0--0--2	50		50	100	1
9	REE664	ELECTRICAL DESIGN & FABRICATION LAB	Core Deptt.	0--0--2	50		50	100	1
10	REE665	SEMINAR – II		0--0--2	50		50	100	1
	TOTAL				620	120	260	1000	24

DEPTT. ELECTIVE COURSE-2

1.. REE061 - Intelligent Sensors & Instrumentation
2.. REE062 - Bio-medical Instrumentation
3.. REE063 - High Voltage Engineering
4.. REE064 - Special Electrical Machines

REE501	ELECTRICAL MACHINES	L T P: 3 0 0	3 Credit

Unit – I: Synchronous Machine-I

Constructional features, Armature winding, EMF Equation, Winding coefficients, Equivalent circuit and phasor diagram, Armature reaction, O.C.& S.C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Operation on infinite bus, Synchronizing power and torque co-efficient.

Unit – II: Synchronous Machine-II

Two reaction theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics.

Synchronous Motor-Starting methods, Effect of varying field current at different loads, V- curves, Hunting & damping, Synchronous condenser.

Unit – III: Three phase Induction Machine–I

Constructional features, Rotating magnetic field, Principle of operation, Phasor diagram, Equivalent circuit, Torque and power equations, Torque-slip characteristics, No-load & blocked rotor tests, Efficiency, Induction generator & its applications

Unit – IV: Three phase Induction Machine-II

Starting, Deep bar and double cage rotors, Cogging &Crawling, Speed control (with and without emf injection in rotor circuit)

Unit – V: Single phase Induction Motor

Double revolving field theory, Equivalent circuit, No-load and blocked rotor tests, Starting methods, Repulsion motor, Universal motor, Brushless DC Motors

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, ' Course on ExpEYES', IIT Bombay (http://spoken-tutorial.org/)

Text Books:

1. D.P. Kothari &I.J. Nagrath, "Electric Machines", Tata Mc GrawHill

2. Smarajit Ghosh, "Electric Machines", Pearson

3. Fitzerald, A.E., Kingsley and S.D. Umans, "Electric Machinery", McGraw Hill.

4. P.S. Bimbhra, "Electrical Machinery", Khanna Publisher

ReferenceBooks:

5. P.S. Bimbhra, "Generalized Theory of Electrical Machines", Khanna Publishers

6. M.G.Say, "AlternatingCurrentMachines", Pitman & Sons

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REE502	POWER TRANSMISSON & DISTRIBUTION	L T P: 3 1 0	4 Credit

Unit – I: Power System Components:

Single line diagram of Power system,
Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar, circuit breaker and isolator.

Supply System: Different kinds of supply system and their comparison, choice of transmission voltage.

Transmission Lines:

Configurations, types of conductors, resistance of line, skin effect, Kelvin's law, Proximity effect.

Unit – II: Over Head Transmission Lines

Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines

Representation and performance of short, medium and long transmission lines, Ferranti effect, Surge impedance loading.

Unit – III: Corona and Interference:

Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference

Electrostatic and electromagnetic interference with communication lines.

Overhead line Insulators:

Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Unit – IV: Mechanical Design of transmission line:

Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers.

Insulated cables:

Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Unit – V: Neutral grounding:

Necessity of neutral grounding, various methods of neutral grounding, earthing transformer, grounding practices.

Distribution Systems:

Distribution system layout, Introduction of Distribution System, Primary & Secondary distribution, Design consideration, distribution system losses, Classification of Distributed system- Radial Ring interconnected systems, Stepped distribution.

Text Books:

1. W.D. Stevenson, "Element of Power System Analysis", McGraw Hill

2. C.L. Wadhwa, “Electrical Power System”, New age international Ltd. Third Edition

3. AsfaqHussain, “Power System”, CBS Publishers and Distributors

4. B. R. Gupta, “Power System Analysis and Design”, Third Edition, S. Chand & Co.

5. M. V. Deshpande, “Electrical Power System Design”, Tata McGraw Hill

6. S. Sivanagaraju & S. Satyanarayana, “Electric Power Transmission and Distribution”, Pearson Education

7. Kothari &Nagrath, “Power System Engineering”,Tata McGraw-Hill Education

8. T.A. Short, “Electric Power Distribution Handbook”, CRC

Reference Books:

9. Soni, Gupta &Bhatnagar, “A Course in Electrical Power “, Dhanpat Rai & Sons

10. S.L. Uppal, “Electric Power”, Khanna Publishers

11. S.N. Singh, “Electric Power Generation, Transmission &Distribution”, PHI Learning

REE503	CONTROL SYSTEM	L T P: 3 0 0	3 Credit

Unit-I: **Control System Concepts**:

Concept of Control system, Physical Systems and their Mathematical Modeling, Constructional and working of AC & DC servomotor, synchros, stepper motor and tachometer. Transfer function models,Block diagram algebra, Signal flow graph, Mason's gain formula,Open loop and closed loop systems and their sensitivity analysis.

Unit-II: Time Response Analysis:

Standard test signals, time response of first and second order systems, time response specifications, steady state errors and error constants.

Design specifications of second order systems,Proportional, Derivative, Integral and PID compensations, design considerations for higher order systems and performance indices.

Unit-III: Stability and Algebraic Criteria:

Concept of stability and its necessary conditions, Routh-Hurwitz criteria and its limitations.

Root Locus Technique:

Root contour, Construction of root loci, Effect of transportation lag and Root locus of non minimal phase system and Effect of pole-zero cancellation.

Unit-IV: Frequency Response Analysis:

Frequency Response analysis from transfer function model, Construction of polar and inverse polar plots.

Stability in Frequency Domain: Nyquist stability criterion, Determination of gain and phase margin from Bode &Nyquist Plots, Nichol Charts, Correlation between time and Frequency Responses.

Unit-V: Introduction to Design:

The design problems and preliminary considerations of lead, lag and lead-lag compensation networks, design of closed loop systems using compensation techniques in time and frequency domains.

State Space Technique:

The concept of state & space, State-space model of physical system, conversion of state-space to transfer function model and vice-versa, Similarity transformation of the control system, Concept of controllability and observability and their testing.

Text Books:

1. Nagrath & Gopal, "Control System Engineering", New age International.

2. K. Ogata, "Modern Control Engineering", Pearson India.

3. B.C. Kuo & Farid Golnaraghi, "Automatic Control System" McGraw Hill, 2018.

4. D. Roy Choudhary, "Modern Control Engineering", Prentice Hall of India.

5. Ambikapathy, "Control Systems",Khanna Publishers

Reference Books:

5. Norman S. Mise, Control System Engineering , Wiley Publishing Co.

6. Ajit K Mandal, “Introduction to Control Engineering” New Age International.

7. R.T. Stefani, B.Shahian, C.J.Savant and G.H. Hostetter, “Design of Feedback Control Systems” Oxford University Press.

8. Samarjit Ghosh, “ Control Systems theory and Applications”, Pearson Education

REE551	ELECTRICAL MACHINES – II LABORATORY	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.

2. To perform load test on a three phase induction motor and draw Torque -speed characteristics

3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.

4. To study speed control of three phase induction motor by varying supply voltage and by keeping V/f ratio constant.

5. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.

6. To determine V-curves and inverted V-curves of a three phase synchronous motor.

7. To determine X_d and X_q of a three phase salient pole synchronous machine using the slip test and to draw the power-angle curve.

8. To study synchronization of an alternator with the infinite bus by using: (i) dark lamp method (ii) two bright and one dark lamp method.

9. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.

10. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.

11. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.

12. To draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.

13. To determine steady state performance of a three phase induction motor using equivalent circuit.

***For Software based experiments (Develop Computer Program in 'C' language or use MATLAB or Equivalent open source software i.e. - Scilab)**

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

REE553	CONTROL SYSTEM LABORATORY	L T P: 0 0 2	1 Credit

Note: The minimum of 10 experiments are to be performed from the following, out of which at least three should be software based.

1. To determine response of first order and second order systems for step input for various values of constant 'K' using linear simulator unit and compare theoretical and practical results.
2. To study P, PI and PID temperature controller for an oven and compare their performance.
3. To study and calibrate temperature using resistance temperature detector (RTD)
4. To design Lag, Lead and Lag-Lead compensators using Bode plot.
5. To study DC position control system
6. To study synchro-transmitter and receiver and obtain output vs input characteristics
7. To determine speed-torque characteristics of an ac servomotor.
8. To study performance of servo voltage stabilizer at various loads using load bank.
9. To study behavior of separately excited dc motor in open loop and closed loop conditions atvarious loads.
10. To study characteristics of positional error detector by angular displacement of two servo potentio-meters.

Software based experiments (Use MATLAB, LABVIEW etc. or equivalent open source freeware software like Scilab using Spoken Tutorial MOOCs)

11. To simulate PID controller for transportation lag.
12. To determine time domain response of a second order system for step input and obtain performance parameters.
13. To convert transfer function of a system into state space form and vice-versa.
14. To plot root locus diagram of an open loop transfer function and determine range of gain 'k' fir stability.
15. To plot a Bode diagram of an open loop transfer function.
16. To draw a Nyquist plot of an open loop transfers functions and examine the stability of the closed loop system.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

Reference Books:

1. K.Ogata,"Modern Control Engineering" Prentice Hall of India.
2. Norman S.Nise, "Control System Engineering", John Wiley & Sons.
3. M.Gopal, "Control Systems: Principles & Design" Tata McGraw Hill.

REE554	SOFTWARE BASED POWER SYSTEM LAB	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list

1. Calculate the parameters of single phase transmission line
2. Calculate the parameters of three phase single circuit transmission line
3. Calculate the parameters of three phase double circuit transmission line
4. Determine the ABCD constant for transmission line.
5. Simulate the Ferranti effect in transmission line
6. Calculate the corona loss of transmission line
7. Calculation of sag & tension of transmission line
8. Calculation of string efficiency of insulator of transmission line
9. Calculation for grading of underground cables
10. Simulate the skin effect in the transmission line
11. Calculation of ground clearance of transmission line
12. Calculate the parameters for underground cable

REE601	POWER ELECTRONICS	L T P: 3 0 0	3 Credit

Unit-I: Power semiconductor devices:

Introduction: Concept of Power Electronics, scope and applications, desired Characteristics of controllable switches

Power semiconductor switches and their characteristics: Power Diode, Power BJT, Power MOSFET, IGBT, SCR, TRIAC, GTO.

Unit-II: Thyristor:
Rating & protection, Methods of SCR commutation, Gate Drive Circuit, Series and Parallel operation.

DC-DC Converters:
Introduction, Control Strategies, Buck converter, Boost Converter, Buck-Boost converter, Analysis of buck converter, Switched Mode power Supply (SMPS).

Unit-III: Phase Controlled Converters:

Single phase half wave controlled rectifier with various loads, Effect of free wheeling diode.
Single phase fully controlled and half controlled bridge converters with various loads. Performance Parameters of single phase uncontrolled and controlled converters.
Three phase half wave converters, Three phase fully controlled and half controlled bridge converters, Effect of source impedance, Single phase and three phase dual converters

Unit-IV: AC Voltage Controllers:

Principle of On-Off and phase controls, Single phase ac voltage controller with resistive and inductive loads, sequence control, Introduction to Matrix converter.

Cyclo Converters:

Basic principle of operation, single phase to single phase, three phase to single phase output voltage equation.

Unit-V: Inverters:

Single phase and Three phase bridge inverters, VSI, CSI, Voltage control of single phaseinverters, PWM Techniques, Introduction to Multi level inverter.

Text Books:

1. M.H. Rashid,"Power Electronics: Circuits, Devices & Applications", Pearson India, 4th Edition,2018.

2. Ned Mohan, T.M.Undeland and W.P.Robbins, "Power Electronics:Converters, Applications and Design", Wiley India Ltd,2008

3. P.C. Sen, " Power Electronics", McGraw Hill Education (India) Pvt. Ltd.

4. P.S. Bhimbra, " Power Electronics", Khanna Publishers.

Reference Books:

5. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd., 2004

6. Chakrabarti &Rai, "Fundamentals of Power Electronics &Drives", Dhanpat Rai & Sons.

7. V.R. Moorthy, " Power Electronics : Devices, Circuits and Industrial Applications" Oxford University Press,2007

8. S.N. Singh, "A Text Book of Power Electronics" DhanpatRai& Sons

REE602	MICROPROCESSOR	L T P: 3 1 0	4 Credit

Unit-I: Introduction to Microprocessor:

Introduction to Microprocessor and its applications, Microprocessor Evolution Tree, Microprocessor Architecture (Harward & Princeton), General Architecture of the Microprocessor and its operations, Component of Microprocessor system: Processor, Buses, Memory, Inputs-outputs (I/Os) and other Interfacing devices.

Unit-II: 8-bit Microprocessor:

Intel 8085 microprocessor:

Pin Diagram, Internal architecture: ALU, Registers, Timing and control unit, interrupt:

Instruction Set of 8085:

Instruction format, op-codes, mnemonics, no. of bytes computation of the instruction, Machine cycles and T-states and Execution time computation of an instruction. Classification of instruction with their examples. Writing of assembly Language programs.

Unit-III: 16-bit Microprocessor:

Architecture of Intel 8086:

Pin Diagram, Bus Interface Unit, Execution unit, Register organization, Memory addressing, Memory Segmentation, Pipelining, Min & Max operating Modes

8086Instruction set:

Format, Addressing Modes, Instruction Set Groups: Data transfer, Arithmetic, Logic, String, Branch control transfer and Processor control.

Interrupts: Hardware and software interrupts.

Unit-IV: Fundamental of Programming:

Program structure for microprocessors, Flowcharts of series, parallel, and controls structures.

Assembler Level Programming:

Memory space allocation for monitor and user program.Assembly language program using Debug or MASM assembler.

Unit-V: Peripheral Interfacing:

Programmed I/O, Memory Mapped I/O, Interrupt Driven I/O, DMA I/O interface, Serial and Parallel communications.

Peripheral Devices:

DMA controller (Intel 8237), Programmable peripheral interface (Intel 8255), Programmable timer/counter (Intl 8253/8254),Programmable Interrupt Controller (Intel 8259).

Text Books:

1. Gaonkar, Ramesh S, “Microprocessor Architecture, programming and applications with the 8085” Pen ram International Publishing 5th Ed.
2. Avtar Singh& Walter A. Triebel “8088 & 8086 Microprocessor” Pearson Education.
3. Ray, A.K. &Burchandi, K.M., “Advanced Microprocessors and Peripherals: Architecture, Programaming and Interfacing” Tata Mc. Graw Hill.
4. AK Gautam, “Advanced Microprocessors”, Khanna Publishers.

Reference Books:

5. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
6. Aditya P Mathur, “Introduction to Microprocessor” Tata McGraw Hill
7. M. Rafiquzzaman, “Microprocessors- Theory & applications”, Pearson India.
8. B. Ram, “Advanced Microprocessor & Interfacing” Tata McGraw Hill
9. Renu Singh & B.P. Singh, “Microprocessor and Interfacing and applications” New Age International
10. Liu and Gibson G.A., “Microcomputer Systems: The 8086/8088 Family Architecture Programming & Design” Pearson India.

REE603	POWER SYSTEM ANALYSIS	L T P: 3 0 0	3 Credit

Unit-I: Representation of Power System Components:

Synchronous machines, Transformers, Transmission lines, One-line diagram, Impedance and reactance diagram, per unit system.

Symmetrical Components:

Symmetrical Components of unbalanced phasors, power in terms of symmetrical components, sequence impedances and sequence networks.

Unit-II: Symmetrical Fault Analysis:

Transient if R-L series circuit, calculation of 3-phase short circuit current and reactance of Synchronous machine, internal voltage of loaded machines under transient conditions.

Unsymmetrical Faults:

Analysis of single line to ground fault, line-to-line fault and Double Line to ground fault on an unloaded generators and power system network with and without fault impedance.

Formation of Zbus using singular transformation and algorithm, computer method for short circuit calculations.

Unit-III: Load Flows:

Introduction, bus classifications, nodal admittance matrix (YBUS), development of load flow equations, load flow solution using Gauss Siedel and Newton-Raphson method, approximation to N-R method, line flow equation sand fast decoupled method.

Unit-IV: Power System Stability:

Stability and Stability limit, Steady state stability study, derivation of Swing equation, transient stability studies by equal area criterion and step-by-step method. Factors affecting steady state and transient stability and methods of improvement.

Unit-V: Traveling Waves:

Wave Equation for uniform Transmission lines, velocity of propagation, surge impedance, reflection and transmission of traveling waves under different line loadings. Bewlay's lattice diagram, protection of equipments and line against traveling waves.

Text Book:

1. W.D. Stevenson, Jr. "Elements of Power System Analysis",McGraw Hill.
2. C.L. Wadhwa, "Electrical Power System", New Age International.
3. Chakraborthy, Soni, Gupta &Bhatnagar, "Power System Engineering", DhanpatRai& Co.
4. T.K. Nagsarkar& M.S. Sukhija, "Power System Analysis" Oxford University Press, 2007.

Reference Books:

5. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
6. Hadi Sadat, “Power System Analysis”, Tata McGraw Hill.
7. D.Das, “Electrical Power Systems” New Age International.
8. J.D. Glover, M. S. Sharma & T. Overbye, “Power System Analysis and Design”, Cengage.
9. P.S.R. Murthy “Power System Analysis” B.S. Publications.
10. Stagg and E1- Abiad, “Computer Methods in Power System Analysis” Tata McGraw Hill
11. Kothari &Nagrath, “Modern Power System Analysis” Tata McGraw Hill
12. A.J. wood, B.F. Wollenberg, ”Power Generation, Operation and Control” John Wiley & Sons

REE661	POWER ELECTRONICS LABORATORY	L T P: 0 0 2	1 Credit

Note: The minimum of 10 experiments is to be performed out of which at least three should be software based.

1. To study triggering of (i) IGBT (ii) MOSFET (iii) power transistor
2. To study V-I characteristics of SCR and measure latching and holding currents.
3. To compare the R, RC &UJT trigger circuit for SCR.
4. To study the commutation circuit for SCR.
5. To study single phase fully controlled bridge rectifiers with resistiveand inductive loads.
6. To study single phase fully controlled bridge rectifiers with DC motor load.
7. To study three-phase fully controlled bridge rectifier with resistive and inductive loads.
8. To study single-phase ac voltage regulator with resistive and inductive loads.
9. To study single phase cyclo-converter
10. To study the four quadrant operation of chopper circuit
11. To study MOSFET/IGBT based single-phase bridge inverter.

Software based experiments(PSPICE/MATLAB or equivalent open source freeware software like Scilab using Spoken Tutorial MOOCs**)**

12. To obtain the simulation of single phase half wave controlled rectifier with R and RL load and plot load voltage and load current waveforms.
13. To obtain simulation of single phase fully controlled bridge rectifier and plot load voltage and load current waveform for inductive load.
14. To obtain simulation of single phase full wave ac voltage controller and draw load voltage andload current waveforms for inductive load.
15. To obtain simulation of step down dc chopper with L-C output filter for inductive load and determine steady-state values of output voltage ripples in output voltage and load current.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOCs, ' Course on Scilab', IIT Bombay (http://spoken-tutorial.org/)

Text/Reference Books:

1. M.H.Rashid, “Power Electronics: Circuits, Devices and Applications”, 3rd Edition, Prentice Hall of India.
2. D.W. Hart, “Introduction to power Electronics”, Prentice Hall of India.

REE662	MICROPROCESSOR LABORATORY	L T P: 0 0 2	1 Credit

A. Study Experiments (any two):

1. To study 8085 based microprocessor system

2. To study 8086 and 8086A based microprocessor system

3. To study Pentium Processor

B. Programming based Experiments (any four):

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.

5. To develop and run a program for arranging in ascending/descending order of a set of Numbers

6. To perform multiplication/division of given numbers

7. To perform conversion of temperature from 0F to 0C and vice-versa

8. To perform computation of square root of a given number

9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four):

10. To obtain interfacing of RAM chip to 8085/8086 based system

11. To obtain interfacing of keyboard controller

12. To obtain interfacing of DMA controller

13. To obtain interfacing of PPI

14. To obtain interfacing of UART/USART

15. To perform microprocessor based stepper motor operation through 8085 kit

16. To perform microprocessor based traffic light control

17. To perform microprocessor based temperature control of hot water

REE664	ELECTRICAL DESIGN & FABRICATION LAB	L T P: 0 0 2	1 Credit

Note: Minimum ten experiments are to be performed from the following list:

1. PCB Design & Fabrication.
2. Transformer design & Fabrication.
3. Small Power Supply design & Fabrication.
4. Filter design & Fabrication.
5. Controller design & Fabrication.
6. Inductor design and Fabrication.
7. Measurement of electrical parameters of AC & DC machine.
8. Design & Fabrication of High Power factor controlled rectifier.
9. Design & Fabrication of Microcontroller based digital energy meters / sensors.
10. Design & Fabrication of Power amplifier.
11. Design Fabrication of AC phase converter and its firing circuit.
12. IGBT based single phase inverter design and Fabrication.
13. Design & Fabrication of chopper.

DEPTT. ELECTIVE COURSE-1

REE051	POWER SYSTEM OPTIMIZATION	L T P: 3 1 0	4 Credit

Unit –I

Introduction to optimization and classical optimization techniques Linear Programming:Standard form, geometry of LPP, Simplex Method pf solving LPP, revised simplex method, duality, decomposition principle, and transportation problem.

Unit –II

Non-Linear Problem (NLP): One dimensional methods, Elimination methods, Interpolation methods, Unconstrained optimization techniques-Direct search and Descent methods, constrained optimization techniques, direct and indirect methods.

Unit –III

Dynamic Programming: Multistage decision processes, concept of sub-optimization and principle of optimality, conversion of final value problem into an initial value problem CPM and PERT

Unit –IV

Genetic Algorithm: Introduction to genetic Algorithm, working principle, coding of variables, fitness function. GA operators; Similarities and difference s between Gas and traditional methods; Unconstrained and constrained optimization using Genetic Algorithm, real coded gas, Advanced Gas, global optimization using GA.

Unit –V

Applications to Power system: Economic Load Dispatch in thermal and Hydro-thermal system using GA and classical optimization techniques, Unit commitment problem, reactive power optimization. Optimal power flow, LPP and NLP techniques to optimal flow problems.

Reference Books:

1. S.S.Rao,"Optimization - Theory and Applications", Wiley-Eastern Limited.
2. David G. Luenberger,"Introduction of Linear and Non-Linear Programming ", Wesley Publishing Company.
3. Polak,"Computational methods in Optimization ", Academic Press.
4. Pierre D.A., "Optimization Theory with Applications", Wiley Publications.
5. Kalyanmoy deb,"Optimization for Engineering Design: Algorithms and Examples", PHI Publication
6. D.E. Goldberg,"Genetic Algorithm in Search Optimization and Machine Learning ", Addision-Wesley Publication, 1989
7. L.P. Singh,"Advanced Power System Analysis and Dynamics ", Wiley Eastern Limited.

8. Olle I. Elewgerd " Electrical Energy System: An Introduction ", TMH Publication, New Delhi

REE052	PRINCIPLES OF COMMUNICATION	L T P: 3 1 0	4 Credit

Unit –I

Introduction: Overview of Communication system, Communication channels, Need for modulation, Baseband and Passband signals, Amplitude Modulation: Double sideband with Carrier (DSB-C), Double side band without Carrier DSB-SC, Single Side Band Modulation SSB, Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator, Radio Transmitter and Receiver.

Unit –II

Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, Bandwidth of FM Signals using Bessel's Function, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting.

Unit –III

Pulse Modulation, Digital Transmission of Analog Signals: Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, Pulse Position Modulation, Their generation and Demodulation, Digital Representation of Analog Signals Pulse Code Modulation (PCM), PCM System Issues in digital transmission: Frequency Division Multiplexing Time Division Multiplexing, T1 Digital System, TDM Hierarchy.

Unit –IV

Differential Pulse Code Modulation, Delta Modulation. Adaptive Delta Modulation, Voice Coders, Sources of Noises, Frequency domain representation of Noise, Super position of Noises, Linear filtering of Noises, Mathematical Representation of Noise.

Unit –V

Noise in Amplitude Modulation: Analysis, Signal to Noise Ratio, Figure of Merit. Noise in Frequency Modulation: Pre-emphasis, De-Emphasis and SNR Improvement, Phase Locked Loops Analog and Digital.

Text Book:

1. Herbert Taub and Donald L. Schilling, "Principles of Communication Systems", Tata McGraw Hill

Reference Books:

1. B.P.Lathi,"ModernDigitalandAnalogcommunicationSystems",3rd Edition, Oxford University Press.
2. Simon Haykin, "Communication Systems", 4th Edition, Wiley India.
3. H.P.Hsu& D. Mitra "Analog and Digital Communications", 2nd Edition, Tata McGraw-Hill.

REE053	FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING	L T P: 3 1 0	4 Credit

Unit-I: Discrete-Time Signals and Systems:

Sequences, discrete time systems, LTI systems, frequency domain representation of discrete time signals and systems, discrete time signals and frequency domain representation, Fourier Transform.

Implementation of discrete time systems:
Structure for FIR system, Structure for IIR systems

Unit-II: Sampling of Continuous Time Signals:

Sampling and reconstruction of signals, frequency domain representation of sampling, discrete time processing of continuous time signals, continuous time processing of discrete time signals, changing the sampling rate using discrete time processing, multi rate signal processing, digital processing of analog signals, over sampling and noise shaping in A/D and D/A conversion

Unit-III: Transform Analysis of LTI Systems:

Frequency response of LTI systems, system functions, frequency response for rational system functions, magnitude-phase relationship, all pass systems, minimum phase systems, and linear systems with generalized linear phase

Discrete Fourier Transform:
Discrete Fourier Transform, properties, linear convolution and circular convolution,

Unit-IV: Filter Design Techniques:

Design of IIR filters using Impulse Invariant Response method and Bilinear Transformation method. Butterworth filters and chebyshev Filter’s response, Design of FIR filters by windowing, Kaiser Window method, optimum approximations of FIR filters,

Unit-V:Efficient computation of the DFT:

FFT algorithms- decimation in time and decimation in frequency, Goertzel algorithm, Implementation of the DFT using convolution,

Introduction to wavelet transform:

Wavelet comparison with Fourier transforms, Applications of Wavelet cosine transform, Discrete cosine transform (DCT).

Text Books:

1. S. Salivahanan, “Digital Signal Processing”, McGraw Hill Education (India) Private Limited.
2. Oppenheim A.V., Schafer, Ronald W. & Buck, John R,”Discrete Time Signal processing”, Pearson Education .

Reference Books:

3. Proakis, J.G. &Manolakis, D.G.," Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall of India.

4. Rabiner, L.R. and Gold B., "Theory and applications of DSP", Prentice Hall of India.

5. Oppenheim, Alan V. &Willsky, Alan S. , "Signals and Systems" , Prentice Hall of India, 2nd Edition

6. Johnson, J.R. , "Introduction to Digital Signal Processing", Prentice Hall of India.

REE054	INTERNET OF THINGS	L T P: 3 1 0	4 Credit

Unit-I: IoT Web Technology

The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.

Unit-II: IoT Applications for Value Creation

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT for Oil and Gas Industry, Opinions on IoTApplication and Value for Industry, Home Management, eHealth.

Unit-III: Internet of Things Privacy, Security and Governance

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smarty Approach. Data Aggregation for the IoT in Smart Cities, Security

Unit-IV: Architectural Approach for IoT Empowerment

Introduction, Defining a Common Architectural Ground, IoT Standardization,M2M Service Layer Standardization, OGC Sensor Web for IoT, IEEE, IETF and ITU-T Standardization activities, Interoperability Challenges, Physical vs. Virtual, Solve the Basic First, Data Interoperability, Semantic Interoperability, Organizational Interoperability, Eternal Interoperability, Importance of Standardization, Plan for Validation and testing, Important Economic Dimension, Research Roadmap for IoT Testing Methodologies. Semantic as an Interoperability Enabler and related work.

Unit-V: Identity Management Models in IoT

Introduction, Vulnerabilities of IoT, Security requirements, Challenges for a secure Internet of Things, identity management, Identity portrayal, Different identity Management model: Local identity, Network identity, Federated identity, Global web identity, Identity management in Internet of Things, User-centric identity management, Device-centric identity management, Hybrid identity management.

Text Books/ Reference Books:

1. Olivier Hersent,DavidBoswarthick, Omar Elloumi, “The Internet of Things key applications and protocols”,Wiley

2. Michael Miller “The Internet of Things” Pearson

3. Adrian McEwen,HakinCassimally, ”Designing the Internet of Things” Wiley India

DEPTT. ELECTIVE COURSE-2

REE061	INTELLIGENT SENSORS & INSTRUMENTATION	L T P: 3 1 0	4 Credit

Unit-I: Intelligent Sensors:

Integrated, smart and intelligent sensors, General Structure of smart sensors& its components, Characteristic of smart sensors: Self calibration, Self-testing&self-communicating, Applications of smart sensors.

Unit-II: Data Acquisition Methods:

Analog and Digital IO, Counters, Timers, Basics ADC designs, Interfacing methods of DAQ hardware, Software structure, Use of simple and intermediate VIs Use of Data Sockets for Networked Communication and Controls.

Unit-III: PC Hardware Review & Instrumentation Buses:

Structure, Timing, Interrupts, DMA, Operating system, ISA, PCI, USB, PCMCIA buses. Parallel Interfaces: IEEE488.1 & 488.2, Serial Interfacing: RS232C, RS422, RS423, RS485; USB, VXI, SCXI, PXI.

Unit-IV: Introduction:

Introduction to Intelligent Instrumentation:

Historical Perspective, current status, software based instruments.

Virtual Instrumentation:

Introduction to graphical programming, Data flow & graphical programming techniques, Advantage of VI techniques, VIs and sub-VIs loops and charts, Arrays, Clusters and graphs, Case and sequence structures, Formula nodes, String and file I/O, Code Interface Nodes and DLL links.

References:

1. G.C. Barney / Intelligent Instrumentation / Prentice Hall, 195.
2. A.S. Moris / Principles of Measurement & Instrumentation / Prentice Hall, 1993.
3. S. Gupta, J.P. Gupta / PC interfacing for Data Acquisition & Process Control, 2nd ED / Instrument Society of America, 1994.
4. Gary Johnson / Lab VIEW Graphical Programing II Edition / McGraw Hill 1997.

REE062	BIO-MEDICAL INSTRUMENTATION	L T P: 3 1 0	4 Credit

Unit-I: Introduction to Biomedical Instrumentation:

Problems encountered in measurements of living systems, Block diagram of Biomedical Instrumentation System & its components and Biomaterials for medical instrument applications. Transducers for biomedical applications.

Bio electric potential: Genesis, Propagation and Distribution (ECG, EEG and EMG).

Unit-II: Bio-potential Electrodes:

Basic types : Micro, Skin surface and needle electrodes and Biochemical transducers: Blood gas,PH and specific ions electrodes.

The cardiovascular system and measurements:

Heart and cardiovascular system and its block diagram, Blood pressure, Blood flow &Heart sound characteristics and their measurements.

Electrocardiography, ECG lead configurations and recordings of ECG.

Unit-III: The Nervous System:

The anatomy of nervous system, Neuronal communication, EPSP & IPSP.

Electroencephalogram characteristic features, Measurement scheme for EEG and 10-20 electrode configuration system.

Human Body & Skin Temperature Measurement:

Temperature measurements using infrared sensors and other sensors, Ultrasonic measurements and its applications in Blood flow measurement and soft tissue imaging.

Unit-IV: Automation of biochemical tests, Instrumentation for X-Ray Machine, CAT, Interfacing of computer with medical instrument, MRI imaging and its applications in biomedical engineering.

Unit-V: Patient care monitoring:

Elements of intensive care unit, Organization of the Hospital for patient-care monitoring, Pace-maker systems, their types and modes, Defibrillators and their types.

Shock hazards from electrical equipment and safety measures.

Bio-telemetry and its applications in patient care and sports.

Text Book:

1. T. Cromwell, F.J. Weibell&F.A.Pfieffer, “Biomedical Instrumentation & Measurements” Prentice Hall International

Reference Books:

1. R.S. Khanpur, “Handbook of Biomedical Instrumentation” Tata McGraw Hill

2. H.E. Thomas, “Handbook of Biomedical Instrumentation and Measurement” Restone Publishing Company

3. J.G. Webester, “Medical Instrumentation”, Houghton Mifflin.

REE063	HIGH VOLTAGE ENGINEERING	L T P: 3 1 0	4 Credit

UNIT-I: Electrostatic Field and Field Stress Control:

Electric field stresses, Numerical methods for Electric field computation, Finite Element Method, Charge simulation method.

Conduction and Break Down in Gases:

Ionization processes, Townsend's criterion, breakdown in electronegative gases, time lags for breakdown, streamer theory, Paschen's law, break down in non-uniform field, and corona discharge.

Break Down in Liquid Dielectrics:

Conduction and breakdown in pure liquid and commercial liquid.

Break Down in Solid Dielectrics:

Intrinsic breakdown, electromechanical breakdown, breakdown of solid, dielectric and composite dielectrics.

UNIT-II: Generation of High Voltages and Currents:

Generation of high direct current voltages, generation of high alternating voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT –III: Measurement of High Voltages and Currents:

Measurement of high direct current voltages, measurement of high alternating and impulse voltages, measurement of high direct, alternating and impulse currents, Cathode Ray Oscillographs for impulse voltage and current measurements.

Insulation Coordination in Electric Power Systems:

Principle of Isolation Coordination in High-Voltage & Extra-High Voltage Power System.

UNIT-IV: Non-Destructive Testing:

Measurement of direct current resistively, measurement of dielectric constant and loss factor, partial discharge measurements

High Voltage Testing:

Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, testing of transformers, testing of surge arresters, radio interference measurements.

Text Books:

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering, Tata Mc-Graw Hill.
2. C. L. Wadhwa, "High Voltage Engineering", Wiley Eastern Ltd.

Reference Books:

3. E. Kuffel and W. S. Zacngal, High Voltage Engineering", Pergamon Press.
4. M. P. Chaurasia , "High Voltage Engineering", Khanna Publishers
5. R. S. Jha, "High Voltage Engineering", DhanpatRai& sons
6. M. Khalifa,' High Voltage Engineering Theory and Practice,' Marcel Dekker.
7. Subir Ray,' An Introduction to High Voltage Engineering' Prentice Hall of India

REE064	SPECIAL ELECTRICAL MACHINES	L T P: 3 1 0	4 Credit

Unit-I: Poly-phase AC Machines:

Construction and performance of double cage and deep bar three phase induction motors; e.m.f. injection in rotor circuit of slip ring induction motor, concept of constant torque and constant power controls, static slip power recovery control schemes (constant torque and constant power),

Unit-II: Induction Generator:

SEIG, DFIG: Operating Principle, Equivalent Circuit, Characteristics, Application

Two Phase AC Servomotors:Construction, torque-speed characteristics, performance and applications.

Unit-III: Stepper Motors:

Principle of operation, variable reluctance, permanent magnet and hybrid stepper motors, characteristics, drive circuits and applications.

Switched Reluctance Motors:Construction; principle of operation; torque production, modes of operation, drive circuits.

Unit-IV: Permanent Magnet Machines:

Types of permanent magnets and their magnetization characteristics, demagnetizing effect,

permanent magnet dc motors, sinusoidal PM A C motors, brushless dc motors and their important features and applications, PCB motors.

Single phase synchronous motor; construction, operating principle and characteristics of reluctance and hysteresis motors; introduction to permanent magnet generators and applications

UNIT-V: Single Phase Commutator Motors:

Construction, principle of operation, characteristics of universal and repulsion motors ; Linear Induction Motors. Construction, principle of operation, Linear force, and applications.

Text Books:

1. P.S. Bimbhra "Generalized Theory of Electrical Machines" Khanna Publishers.

2. P.C. Sen "Principles of Electrical Machines and Power Electronics" Johnwilley&Sons, 2001

Reference Books:

3. Cyril G. Veinott "Fractional and Sub-fractional horse power electric motors" McGraw Hill International, 1987

4. M.G. Say "Alternating current Machines" Pitman & Sons.

Dr. A.P.J. Abdul Kalam Technical UniversityUttar Pradesh,Lucknow

Syllabus

for

B. Tech. Mechanical Engineering

Third Year

(Effective from the Session: 2018-19)

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-V

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS501	Managerial Economics	Applied Science	3--0--0	70	20	10	100	3
2	RAS502/ RUC501	Sociology /Cyber Security	Applied Science	3--0--0	70	20	10	100	3
3	RME501	Machine Design-I	Core Deptt.	3--0--0	70	20	10	100	3
4	RME502	Heat & Mass Transfer	Core Deptt.	3--1--0	70	20	10	100	4
5	RME503	Manufacturing Science& Technology-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME051-054	Deptt. Elective Course-1	Core Deptt.	3--1--0	70	20	10	100	4
7	RME551	Design and Simulation Lab I	Core Deptt.	0--0--2	50		50	100	1
8	RME552	Heat & Mass Transfer Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME553	Manufacturing Technology-II Lab	Core Deptt.	0--0--2	50		50	100	1
10	RME559	Seminar – I		0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-1

1. **RME-051 IC Engines and Compressors**
2. **RME-052 Mechatronics and Microprocessor**
3. **RME-053 Finite Element Methods**
4. **RME-054 Engineering Optimization**

STUDY AND EVALUATION SCHEME

B-Tech. Mechanical Engineering

YEAR: 3rd / SEMESTER-VI

S. No.	Subject Code	Subject Name	Department	L-T-P	Theory / Lab Marks	SESSIONAL		Total	Credit
						Test	Assignment / Attendance		
1	RAS601	Industrial Management	Applied Science	3--0--0	70	20	10	100	3
2	RUC601/ RAS602	Cyber Security/ Sociology	Applied Science	3--0--0	70	20	10	100	3
3	RME601	Fluid Machinery	Core Deptt.	3--0--0	70	20	10	100	3
4	RME602	Theory of Machines	Core Deptt.	3--1--0	70	20	10	100	4
5	RME603	Machine Design-II	Core Deptt.	3--0--0	70	20	10	100	3
6	RME061-064	Deptt. Elective Course-2	Core Deptt.	3--1--0	70	20	10	100	4
7	RME651	Fluid Machinery Lab	Core Deptt.	0--0--2	50		50	100	1
8	RME652	Theory of Machines Lab	Core Deptt.	0--0--2	50		50	100	1
9	RME653	Design and Simulation Lab II	Core Deptt.	0--0--2	50		50	100	1
10	RME654	Refrigeration & Air-conditioning	Core Deptt.	0--0--2	50		50	100	1
TOTAL								**1000**	**24**

DEPTT ELECTIVE COURSE-2

1. **RME061 Refrigeration & Air-conditioning**
2. **RME062 Production Planning and Control**
3. **RME063 Mechanical Vibration**
4. **RME064 Reliability Engineering**

MACHINE DESIGN-I **L T P**

3 0 0

8

UNIT I

Introduction

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

Design for Static Load

Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II

8

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor,Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria.

Riveted Joints

Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III

8

Shafts

Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

UNIT IV

8

Mechanical Springs

Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

UNIT V

8

Keys and Couplings

Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings.

Power Screws

Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements,V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.

3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

HEAT & MASS TRANSFER **L T P**
3 1 0

UNIT-1

Introduction to Heat Transfer:

Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

2

Conduction :

General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems.Initial and boundary conditions.

3

Steady State one-dimensional Heat conduction :

Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance.Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

3

UNIT-2 Fins:

Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells.

3

Transient Conduction:

Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only, Heisler charts.

UNIT-3

Forced Convection:

Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

5

Natural Convection :

Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

5

3

UNIT-4

Thermal Radiation :

Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

8

UNIT-5

Heat Exchanger :

Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.

3

Condensation and Boiling:

Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside of a horizontal tube; Effect of non-condensable gases; Dropwise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

3

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion though a stagnant gas film.

2

Books:

1. Fundamentals of Heat and Mass Transfer, by Incroperra& DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House

MANUFACTURING SCIENCE& TECHNOLOGY-II **L T P**

3 0 0

Unit I

Metal Cutting-

Mechanics of metal cutting. Geometry of tool and nomenclature .ASA system Orthogonal vs. oblique cutting. Mechanics of chip formation, types of chips. Shear angle relationship. Merchant's force circle diagram. Cutting forces, power required. Heat generation and cutting tool temperature, Cutting fluids/lubricants. Tool materials. Tool wear and tool life. Machinability. Dynamometer, Brief introduction to machine tool vibration and surface finish. Economics of metal cutting.

9

Unit-II

Machine Tools

(i) Lathe: Principle, construction, types, operations, Turret/capstan, semi/Automatic, Tool layout

2

(ii) Shaper, slotter, planer: Construction, operations & drives.

1

(iii) Milling: Construction, Milling cutters, up & down milling. Dividing head & indexing. Max chip thickness & power required.

2

(iv) Drilling and boring: Drilling, boring, reaming tools. Geometry of twist drills.

2

Unit-III

Grinding & Super finishing

(i) Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear - attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding.Centerless grinding

4

(ii) Super finishing: Honing, lapping and polishing.

1

Limits, Fits & Tolerance and Surface roughness:

Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness.

3

Unit-IV

B. Metal Joining (Welding)

Survey of welding and allied processes. Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electroslag, friction welding. Soldering & Brazing. Adhesive bonding. Thermodynamic and Metallurgical aspects in welding and weld, Weldability, Shrinkage/residual stress in welds. Distortions & Defects in welds andremedies. Weld decay in HAZ

10

Unit-V

C. Introduction to Unconventional Machining and Welding

Need & benefits, application and working principle of EDM, ECM, LBM, EBM, USM. AJM, WJM. Similarly, non-conventional welding applications such as LBW, USW, EBW, Plasma- arc welding, Diffusion welding, Explosive welding/cladding. Introduction to Hybrid machining processes

6

Books and References:

1. Manufacturing Science – A. Ghosh and A.K. Mallik,Affiliated East-West Press
2. Fundamentals of Metal Machining and Machine Tools – Geoffrey Boothroyd, CRC Press
3. Production Technology - R.K. Jain Khanna Publishers.

4. Introduction to Manufacturing Processes – John A. Schey ,McGraw-Hill
5. Production Engineering Science - P.C. Pandey,Standard Publishers Distributors,
6. Modern Machining Processes - P.C. Pandey& H.S. Shan, McGraw-Hill
7. Degarmo's Materials and Processes in Manufacturing - Ernest P. De Garmo, J. T. Black, Ronald A. Kohser, Wiley
8. Fundamentals of Metal Cutting & Machine Tools – B.L. Juneja& G.S. ShekhonWiley
9. Process &Materials of Manufacturing – R.A. Lindburg, Pearson Eductaion
10. Advanced Machining Process - VK Jain ,Allied Publishers
11. Manufacturing Engineering & Technology, -Kalpakjian, Pearson
12. Manufacturing Technology Part I and Part II,-Rao,PN, McGraw-Hill

DepartmentalElective Course-1

I C ENGINES & COMPRESSORS

L T P
3 1 0

Unit-1
Introduction to I.C Engines: Engine classification and basic terminology, Two and four stroke engines, SI and CI engines, Valve timing diagram.
Thermodynamic analysis of Air standard cycles, Otto cycle, Diesel cycle, Dual cycle, Stirling cycle, Ericsson cycles, Comparison of Otto, Diesel and Dual cycles
Fuel air cycle, factors affecting the fuel air cycle, Actual cycle.
8

Unit–II
SI Engines: Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines.
Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine
Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect
9

Unit–III
CI Engine: Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI engines.
Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings
Exhaust emissions from SI engine and CI engine and it's control
9

Unit-IV
Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation.
Fuels: Fuels for SI and CI engine , Important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.
Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines
9

Unit V
Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency.
Rotary compressors, Classification, Centrifugal compressor , Axial compressors, Surging and stalling, Roots blower, Vaned compressor.
7

BOOKS:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing CO.
2. Fundamentals of Internal Combustion Engines by H.N. Gupta, Prentice Hall of India
3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek,,Pearson Eductaion

MECHATRONICS AND MICROPROCESSOR **L T P**
3 1 0

Unit 1

Introduction, synergy of systems, definition of mechatronics, applications of mechatronics in design and modeling, actuators and sensors, intelligent controls, robotics, manufacturing etc., objectives, advantages and disadvantages of mechatronics, examples of mechatronics systems in industry.

Mechanical components in mechatronics, force, friction and lubrication, materials, mechanical behavior of materials, mechanisms used in mechatronics, lever and four bar mechanisms, bearing, belt, chain, cam, slider crank, clutches etc.

8

Unit II

Electronics elements in mechatronics, conductors, insulators and semiconductors, passive electrical components, resistors, capacitor and inductor, transformer, active elements, semiconductor devices, transistors and integrated circuits, digital electronics components like logic gates, flip-flops, shift register, multiplexer and counter.

Computing elements in mechatronics, analog computer, timer, analog to digital converter, digital to analog converter, digital computer, microprocessor and its architecture, micro-controllers, programming logic controllers, their basic structures, mnemonics.

8

Unit III

System modeling and analysis, control system concepts, transfer function of physical systems, block diagrams representation of systems, transfer function of a system, standard input signals, time response of a first and second order systems to a step input, frequency response analysis, automatic control systems, digital control systems.

Motion control devices, actuator types & application areas, hydraulic and pneumatic actuators, electrical actuators, DC servomotor, AC servomotor and stepper servomotor, micro-actuators, drive selection and applications.

8

Unit IV

Sensors and transducers, their static and dynamic performance characteristics, internal sensors, external sensors and micro-sensors, sensors for displacement, position and proximity; velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature, light sensors, selection of Sensors.

Stages in designing mechatronics systems, traditional and mechatronic design, possible design solutions, case studies of mechatronics systems, pick and place robot, automatic car park systems, engine management systems etc.

8

Unit V

Mechatronics in industry, autotronics, bionics and avionics and their various applications, mechatronics in manufacturing, features of mechatronics in manufacturing, flexible manufacturing systems, manufacturing automatic protocol, computer integrated manufacturing, just in time production systems, CNC machines, adaptive control machine system, CNC machine operations, challenges in mechatronics production units.

8

BOOKS & REFERENCES:

1. A Kuttan, “Introduction to Mechatronics, Oxford University Press, 2010.
2. Alciatore&Histand, “Introduction to Mechatronics & Measurement Systems, 4e”, McGraw-Hill Education, 2014.
3. M Jouaneh, “Fundamentals of Mechatronics”, Cengage Learning, 2013.
4. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.
5. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
6. Dan Necsulesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
7. NitaigourPremchandMahadik, “Mechatronics”, McGraw-Hill Education, 2015.
8. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering, An Introduction to Mechatronics”, Prentice – Hall of India Pvt., Ltd., 2000.
9. Ramachandran K. P., Vijayaraghavan G. K., Balasundaram M.S. “Mechatronics: Integrated Mechanical Electronic Systems”, Wiley

FINITE ELEMENT METHODS **L T P**

3 1 0

Unit 1

Introduction, exact solution vs approximate solution, principle of FEM, general procedure for finite element analysis, pre-processing, solution, post processing, various approximate methods, weighted residual method, variational or Rayleigh Ritz method, principle of minimum potential energy.
Review of matrices, definition, types, addition or subtraction, multiplication, inverse of a matrix, calculus of matrix.

8

Unit II

Direct stiffness methods, linear spring as finite element, direct formulation of uni-axial bar, truss and beam elements, local and global coordinates, nodes and elements, stiffness matrix, formulation of global stiffness matrix, application of boundary conditions and forces, essential and natural boundary conditions, elimination method, penalty methods, calculation of element stresses and strains.

8

Unit III

Finite element formulation of 1-d problems, method of weighted residuals, strong and weak form, the Galerkin finite element method, application of Galerkin’s method to uni-axial bar and truss elements, Galerkin method for one dimensional heat conduction problems like heat transfer through wall, heat transfer through fin etc., one dimensional conduction with convection.

8

Unit IV

Interpolation or shape functions, compatibility, completeness and convergence requirements, shape functions for one and two dimensional elements, finding shape function using Lagrange polynomials. Application of FEM in scalar field problems, heat transfer in two dimensions, time dependent heat transfer.

8

Unit V

Concepts of plane stress and plain strain, displacement relation, stress-strain relations, equilibrium and compatibility equations, vector field problems, derivation of constant strain triangular element stiffness matrix and equations, treatment of body and surface forces, stress and strain computation.
Practical considerations in finite element application, programming aspects, commercially available FEM packages, desirable features of a FEM packages, problem solving on a general purpose FEM software package like ANSYS, ABAQUS, NISA etc.

8

Books and References:

1. Fundamentals of Finite Element Analysis by David V Hutton, McGraw-Hill Learning
2. A First Course in Finite Element Method 5e by Daryl L Logan, Cengage Learning

3. Finite Element Analysis by G L Narasaiah, BS Publications.
4. An Introduction to Finite Element Method, 3e by J N Reddy, McGraw-Hill
5. Finite Element Method with Application in Engineering by Desai, Eldho and Shah, Pearson Education.
6. Introduction to Finite Element Analysis and Design by Kim & Shankar, John Wiley & Sons.
7. Introduction to Finite Elements in Engineering by Chandrupatla&Belagundu, Pearson Education.

ENGINEERING OPTIMIZATION **L T P**
3 1 0

UNIT I
Introduct
ion:
Historical Developments, and Review of Engineering applications of Optimization Techniques
Linear Programming:
Simplex method, Revised simplex method, Two phase method, Duality, Dual simplex method, Integer linear programming, 0-1 integer linear programming, solution by branch and bound method.

9

UNIT II
Classical Optimization Techniques: Introduction, Review of single and multivariableoptimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

8

UNIT-III
Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane methodand Method of Feasibledirections, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems

8

UNIT-IV
Unconstrained Optimization Techniques: Introduction, Direct search method - Random,Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods - Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

8

UNIT-V
Geometric Programming: Introduction, Unconstrained minimization problems, solution ofunconstrained problem from arithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

Books and References:

1. Engineering Optimization by Ravindran, Wiley India
2. Engineering Optimization:Theory and Application by S SRao, Wiley India
3. Linear and Non Linear Programming by Luenberger , Narosa

Design and Simulation - Lab I

L T P
0 0 2

Minimum eight experiments out of the following are to be performed.

Students are advised to use design data book for the design. Drawing shall be made wherever necessary on small drawing sheets

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

HEAT & MASS TRANSFER – LAB

L T P
0 0 2

Minimum eight experiment of the following

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3 Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Convection - Heat Pipe experiment.
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10 Convection - Determination of thermal conductivity of fluid
11 Experiment on Stefan's Law, on radiation determination of emissivity, etc.
12 Experiment on solar collector, etc.
13. Heat exchanger - Parallel flow experiment

Heat exchanger - Counter flow experiment

MANUFACTURING TECHNOLOGY-II – LAB

L T P
0 0 2

Mini
mum eight experiments out of the following along-with study of the machines / processes

1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.
5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill.
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses
11. Gas welding experiment
12. Arc welding experiment
13. Resistance welding experiment.
14. Soldering & Brazing experiment

SEMESTER - VI

FLUID MACHINERY **L T P**
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UNIT-I
Introduction: Impulse of Jet and Impulse Turbines:
Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat *&c*urve), Classification of turbines, Impulse turbines, Constructional details, Velocitytriangles, Power and efficiency calculations, Governing of Pelton wheel

8

UNIT-II
Reaction Turbines:
Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.

8

UNIT-III
Centrifugal
Pumps:
Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.

8

UNIT-IV
Positive Displacement and other Pumps:
Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics.

UNIT-V

8

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram,hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Spoken Tutorial (MOOCs):

Spoken Tutorial MOOC, 'Course on OpenFOAM', IIT Bombay(http://spoken-tutorial.org/)

BOOKS:

1. Hydraulic Machines by Jagdish Lal, Metropolitan book co. pvt ltd.
2. Hydraulic Machines by K Subramanya, Tata McGraw Hill
3. Fluid Mechanics and Machinery by C.S.P.Ojha, R. Berndtsson, P.N. Chandramouli, Oxford University Press
4. Fluid Mechanics and Fluid Power Engineering by D S Kumar, S K Kataria& Sons
5. Fluid Mechanics and Turbo machines by Das, PHI
6. Fluid Power with Applications, by Esposito, Pearson
7. Fluid Mechanics and hydraulic machines by Modi& Seth, Standard Book House
8. Fundamentals of Turbomachinery by Venkanna B.K., PHI
9. Hydraulic Machines: Theory & Design, V.P.Vasandhani, Khanna Pub.
10. Fluid Mechanics and Hydraulic Machines by SukumarPati, Tata McGraw Hill

THEORY OF MACHINES **L:T:P**

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Unit I

8

Introduction, mechanisms and machines, kinematics and kinetics, types of links, kinematic pairs and their classification, types of constraint, degrees of freedom of planar mechanism, Grubler's equation, mechanisms, inversion of four bar chain, slider crank chain and double slider crank chain.

Velocity analysis:

Introduction, velocity of point in mechanism, relative velocity method, velocities in four bar mechanism, instantaneous center .

Acceleration analysis:

Introduction, acceleration of a point on a link, acceleration diagram, Corioli's component of acceleration, crank and slotted lever mechanism,.

Unit II

8

Cams

Introduction, classification of cams and followers, cam profiles for knife edge, roller and flat faced followers for uniform velocity, uniform acceleration,

Gears and gear trains

Introduction, classification of gears, law of gearing, tooth forms and their comparisons, systems of gear teeth, length of path of contact, contact ratio, minimum number of teeth on gear and pinion to avoid interference, simple, compound, reverted and planetary gear trains, sun and planet gear train.

Unit III

8

Force analysis:

Static force analysis of mechanisms, D'Alembert's Principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning

moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.

Unit IV

8

Balancing

:

Introduction,static balance, dynamic balance, balancing of rotating masses,two plane balancing, graphical and analytical methods, balancing of reciprocating masses,

Governors:

Introduction, types of governors, characteristics of centrifugal governors, gravitycontrolled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor

Unit V

8

Brakes and dynamometers:
Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

Text/Reference Books:

1. Kinematics and dynamics of machinery: Wilson and Sadler, Third edition, Pearson.
2. Theory of Mechanisms and Machines: AmitabhaGhosh and Ashok kumarMallik, Third Edition Affiliated East-West Press.
3. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Oxford University Press
4. Kinematics and dynamics of machinery: R L Norton, McGraw Hill
5. Theory of Mchines: S.S. Rattan, McGraw Hill
6. Theory of Mchines: Thomas Bevan, CBS Publishers.

MACHINE DESIGN-II

L:T:P

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UNIT I
Principle of transmission and conjugate action
Spur Gears
Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

6

Helical Gears
Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.

UNIT II Bevel gears
Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears,Effective load of gear tooth, Design of a bevel gear system.

4

Worm Gears
Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.

4

UNIT III
Sliding Contact Bearing
Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

6

UNIT IV

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

6

UNIT V

IC ENGINE parts,

Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft

10

Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria& Sons.
3. Machine Design, U C Jindal, Pearson Eductaion.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Eesign-M.F. Spott, Pearson Eductaion
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
9. Elements of Machine Component Design, Juvinal&Marshek, John Wiley & Sons.

DepartmentalElective Course-II

REFRIGERATION & AIR CONDITIONING **L T P**

3 1 0

Unit-1

**Refrigerat
ion:**

Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle:

Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

8

Unit-2

Vapour Compression System:

Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

8

Unit-3

Vapour Absorption system;

Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.

5

Refrigerants:
Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants

3

Unit-4
Air Conditioning:
Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.

9

Unit-5
Refrigeration Equipment & Application:
Elementary knowledge of refrigeration & air conditioning equipmentse.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

7

Books:

1. Refrigeration and Air conditioning by C.P Arora, McGraw-Hill
2. Refrigeration and Air conditioning, by Manohar Prasad, New Age International (P) Ltd.Pub.
3. Refrigeration and Air conditioning by R. C. Arora, PHI
4. Principles of Refrigeration by Roy J. Dossat. Pearson Education
5. Refrigeration and Air conditioning by stoecker& Jones. McGraw-Hill
7. Refrigeration and Air conditioning by Arora&Domkundwar. DhanpatRai
7. Thermal Environment Engg. byKuhen, Ramsey &Thelked.

PRODUCTION PLANNING & CONTROL **L T P**
3 1 0

Unit-I
Introduction:
Types and characteristics of Manufacturing systems and Production systems, Objective and functions of Production, Planning & Control, organization

4

Preplanning:
Forecasting & Market Analysis.Factory Location & Layout, Equipment policy and replacement. Preplanning production, capacity planning

4

Unit-II
Production Planning:
Product development and design. BEP, profit volume chart, Material Resource Planning, Selection of material, methods, machines & manpower. Routing, Loading, Scheduling, Job shop scheduling, sequencing of production operation, line balancing

9

Unit-III
Production
Control:
Dispatching rules, dispatching of work card, move card, inspection card and reports, Control boards and charts. Expediting, progress reporting, corrective action, change in schedules.
6

Unit-IV
Evaluation and Analysis:
Elements of network and its development, Introduction to CPM and PERT techniques.
7

UNIT-V
Material Planning and Control:
Field and scope, material planning, inventories, types and classification, ABC analysis, economic lot (batch) size, lead time and reorder point, modern trends in purchasing, store keeping, store operations, Introduction to manufacturing resource planning (MRP) and enterprise resource planning (ERP)
10

Books and References:

1. Elements of Production Planning & Control by Samuel Eilon, Universal Publishing Corporation.
2. Production Planning & Control & Industrial Management by K.C. Jain and L.N. Agarwal, Khanna Publishers.
3. Modern Production/Operations Management by E.S. Buffa , Wiley.
4. Production System: Planning, Analysis, and Control by J.L. Riggs,Wiley.
5. Production Planning and Inventory Managementby J.F. Magee &David Morris BOODMAN, McGraw Hill.
6. Industrial Engg& Management by O.P. Khanna, DhanpatRai& Sons.

MECHANICAL VIBRATIONS **L T P**
3 1 0

UNIT - I
Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.
3

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.
5

UNIT - II
Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments
8

UNIT- III
Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.
8

UNIT- IV

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts.

8

UNIT- V

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method

5

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

3

Books and References:

1. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee.
2. Mechanical Vibrations-Theory & Practice, S Bhave, Pearson Education.
3. Mechanical Vibrations-Theory & Applications, Singhal, Katson Books.
4. Theory of Vibrations with Applications, Thomson&Dahleh, Pearson Education.
5. Elements of Vibration Analysis, L Meirovitch, McGraw-Hill Education.
6. Mechanical Vibrations – Tse, Morse & Hinkle
7. Mechanical Vibrations – V. Rama Murthy, Narosa Publications
8. Mechanical Vibrations – D. Nag, Wiley

RELIABILITY ENGINEERING **L T P**

3 1 0

UNIT-I

8

Introduction: Definition of reliability, Failures & failures modes, Failure rates, MTTF, MTBF, Bath tub curve, Definition and factors influencing system effectiveness, various parameters of system effectiveness.

UNIT-II

8

Reliability Mathematics, Definition of probability, laws of probability, conditional probability, Bay's theorem, Various probability distributions, Data collection, Recovery of data, Data analysis Procedures, Empirical reliability calculations.

UNIT-III

8

Reliability types, System of series, parallel, series parallel, Stand by and complex systems; Development of logic diagram, Methods of reliability evaluation; Cut set and tie set methods, Matrix methods, Event trees and fault trees methods, Reliability evaluation using probability distributions, The Weibull distribution and its application in reliability, Markov method, Frequency and duration method.

UNIT-IV

8

Reliability Improvements: Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance

UNIT-IV

8

Reliability Testing, Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

Books & references:

1. R.Billintan& R.N. Allan,"Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor& L.R. Lamberson,"Reliability in Engineering and Design", John Wiely and Sons.
3. S.K. Sinha& B.K. Kale,"Life Testing and Reliability Estimation", Wiely Eastern Ltd.
4. A Birolini. Reliability Engineering-Theory & Practice, Springer.
5. G.H.Sandler,"System Reliability Engineering", Prentice Hall.
6. D J Smith, Reliability, Maintainability & Risk, Butterworth-Heinemann.

FLUID MACHINERY Lab **L T P**

0 0 2

Minimum ten experiments out of the following along with study of the machines and processes

1. Impact of Jet experiment.
2. Experiment on Pelton wheel.
3. Experiment on Francis turbine.
4. Experiment on Kaplan turbine.
5. Experiment on Reciprocating pump.
6. Experiment on centrifugal pump.
7. Experiment on Hydraulic Jack/Press
8. Experiment on Hydraulic Brake
9. Experiment on Hydraulic Ram
10. Study through visit of any water pumping station/plant
11. Any other suitable experiment/test rig such as comparison & performance of different types of pumps and turbines.
12. Experiment on Compressor
13. Experiment for measurement of drag and lift on aerofoil in wind tunnel

THEORY OF MACHINES LAB **L T P**

0 0 2

Minimum eight experiments out of the following:

1. Study of simple linkage models/mechanisms

2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

Design And Simulation - Lab II **L T P**
0 0 2

A. Computer and Language :students are required to learn the basics of computer language such as Cand C++ so that they should be able to write the computer programme (*3practical turns*)

B. Writing Computer programme for conventional design: Students are required to write computerprogram and validate it for the design of machine components done in theory subject (*5practical turns*)

C. Mini Project: Each **s**tudent will be given a real life problem for the complete design of asubsystem/system using either manual calculation with the help of design handbook or through computer programme, if needed. This will be done as home assignment to be submitted at the end of the semester.

REFRIGERATION & AIR CONDITIONING Lab **L T P**
0 0 2

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.

11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency , PV diagram and effect of intercooling.
13. Study of Hermetically sealed compressor.
14. Experiment on Desert coolers.

L T P
3 1 0

G. B. Technical University, Lucknow

SYLLABUS

B.Tech THIRD and FOURTH YEAR

(Semester V, VI, VII and VIII)

Computer Science & Engineering
and
Information Technology

Effective from session 2010-11

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering

Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	ECS-503	Object Oriented Techniques	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	ECS-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	ECS-553	Object Oriented Techniques Lab*	0-0-2	-	25	25	25	50
10	ECS-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	ECS-602	Software Engineering	3-1-0	30	20	50	100	150
4	ECS-603	Compiler Design	3-1-0	30	20	50	100	150
5	ECS-604	Web Technology	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	ECS-652	Web Technology based Software Engineering Lab*	0-0-2	-	25	25	25	50
9	ECS-653	Compiler Lab*	0-0-2	-	25	25	25	50
10	ECS-654	Seminar	0-0-2	-	50	50	-	50
11	GP-601	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

* ***Note:* *ECS- 088*** *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology
Year-III, Semester-V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	EIT-501	E-Commerce	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	EIT-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	EIT-553	Mini Project using Web Technology -1	0-0-2	-	25	25	25	50
10	EIT-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2010-11

Information Technology
Year-III, Semester-VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	EIT-601	Software Project Management	3-1-0	30	20	50	100	150
4		IT-Elective-I	3-1-0	30	20	50	100	150
5	EIT-602	ERP	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	EIT-652	Software Project Management Lab *	0-0-2	-	25	25	25	50
9	EIT-653	Mini Project using Web Technology -2	0-0-2	-	25	25	25	50
10	EIT-654	Seminar	0-0-2	-	50	50		50
11	GP-601	General Proficiency	-	-	-	-	-	50

Note: *EIT-553 (Mini Project using web technology-1) started in 5th semester has to be continued and completed in 6th semester as EIT-653 (Mini Project using web technology-2)*

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2011-12

Information Technology
Year-IV, Semester-VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	EIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150
3	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
4		IT-Elective-II	3-1-0	30	20	50	100	150
5		IT-Elective-III	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	EIT-751	Cryptography & Network Security Lab*	0-0-2	-	25	25	25	50
7	EIT-752	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
8	EIT-753	Project	0-0-4	-	50	50	-	50
9	EIT-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

Note:** ***ECS- 088 *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

SYLLABUS

(Computer Science & Engineering and Information Technology)

ECS-501: Operating System

Unit – I

Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III

CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV

Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V

I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,

TMH
5. William Stallings, "Operating Systems: Internals and Design Principles ", 6th Edition, Pearson Education

ECS-502: Design and Analysis of Algorithms

Unit-I
Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit -II
Advanced Data Structures*:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.

Unit - III
Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.
Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim's and Kruskal's algorithms, Single source shortest paths - Dijkstra's and Bellman Ford algorithms.

Unit - IV
Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal's and Floyd's algorithms, Resource allocation problem.
Backtracking, Branch and Bound with examples such as Travelling Salesman Problem,
Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V
Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

ECS-503: Object Oriented Techniques

UNIT I

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT III

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

UNIT IV

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,
Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

UNIT V

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application.
Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

References:

1. James Rumbaugh et. al, “Object Oriented Modeling and Design”, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education
3. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
4. Mark Priestley “Practical Object-Oriented Design with UML”, TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, “Object Oriented Analysis and Design with Applications”, Pearson Education
6. Pandey, Tiwari, “ Object Oriented Programming with JAVA” , Acme Learning

ECS-504: Computer Graphics

Unit – I

Introduction and Line Generation**:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations**:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms-Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces**:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Hidden Lines and Surfaces**:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, TMH

3. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education
4. Steven Harrington, “Computer Graphics: A Programming Approach” , TMH
5. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill

ECS-505: Graph Theory

Unit -I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit -IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem

Discussion of Graph theoretic algorithm wherever required.

References

1. Deo, N, Graph theory with applications to Engineering and Computer Science, PHI
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH
3. Robin J. Wilson, Introduction to Graph Theory, Pearson Education
4. Harary, F, Graph Theory, Narosa
5. Bondy and Murthy: Graph theory and application. Addison Wesley.
6. V. Balakrishnan, Schaum's Outline of Graph Theory, TMH
7. Geir Agnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson Education

EIT-501: E-Commerce

Unit I :

Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit II:

Network Infrastructure for E- Commerce:
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Unit III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit IV

Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit V

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.

EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison- Wesley.
2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International
3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

EIT-505 Information Security and Cyber Laws

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services,

Information System Threats and attacks, Classification of Threats and Assessing Damages

Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls,

Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection

Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-IV

Security metrics- Classification and their benefits

Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mIning Security, Building Security into Software Life Cycle

Ethics- Ethical Issues, Issues in Data and Software Privacy

Cyber Crime Types & overview of Cyber Crimes

References :

1. Godbole,“ Information Systems Security”, Willey
2. Merkov, Breithaupt,“ Information Security”, Pearson Education
3. Yadav, “Foundations of Information Technology”, New Age, Delhi
4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill
5. Sood,“Cyber Laws Simplified”, Mc Graw Hill
6. Furnell, “Computer Insecurity”, Springer
7. IT Act 2000

ECS-601: Computer Network

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

References :

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Anuranjan Misra, “Computer Networks”, Acme Learning
5. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS-602: Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design
Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing
Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management
Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

ECS-603: Compiler Design

Unit – I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.
Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis

References:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools", Pearson Education
2. V Raghvan, " Principles of Compiler Design", TMH
3. Kenneth Louden," Compiler Construction", Cengage Learning.
4. Charles Fischer and Ricard LeBlanc," Crafting a Compiler with C", Pearson Education

ECS-604 Web Technology

Unit I: Introduction

Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

Unit II: Web Page Designing

HTML: list, table, images, frames, forms, CSS;
XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting

Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; introduction to AJAX, VB Script, CGI

Unit IV: Server Site Programming

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

References

1. Xavier, C, " Web Technology and Design" , New Age International
2. Deitel, "Java for programmers", Pearson Education
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
4. Ramesh Bangia, "Internet and Web Design" , New Age International
5. Jackson, "Web Technologies" Pearson Education
6. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning

EIT-601: Software Project Management

UNIT-I: Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

EIT-602: ERP

UNIT - I
ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV
ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V
ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.
Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I
Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II
Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III
Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV
Morphological Image Processing
Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation
Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I
Introduction to security attacks, services and mechanism, Classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I
Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II
Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III
Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV
Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V
Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, “Software Reliability Engineering”, McGraw-Hill
2. Fenton, and Pfleeger, “Software Metrics: A Rigorous and Practical Approach”, International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

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ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms-Permutation, Combinations, Derrangements.

References:
1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I
Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II
Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III
Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV
Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I
Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:

Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I

Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.

Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.

Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.

Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II

Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III
Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV
Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V
Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,
Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I
Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II
Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III

Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV

Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V

Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:

Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References
1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, “Computer Forensics: Crime scene Investigation”, Firewall Media
5. Christopher L.T. Brown, “Computer Evidence: Collection and Preservation”, Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, “Real Time Systems”, Pearson Education
3. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.

Modeling and Characterization of Embedded Computation System.

Unit-IV

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V

Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:
Neurocomputing and Neuroscience
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I
Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II
Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III
Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV
Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V
Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley.
4. Upadhyaya, “Mobile Computing”, Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV
Morphological Image Processing
Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation
Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction
Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects
Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks
Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression
Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis
Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images
Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

Dr.A.P.J.Abdulkalam Technical University, UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

YEAR forth, SEMESTER –VII

(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NCS-701	Distributed System	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NCS-751	Distributed System *	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

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STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

YEAR forth, SEMESTER –VIII

(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NCS-801	Digital Image Processing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practical's / Training /Projects									
5	NCS-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

Open Elective I

1. NOE-071 Entrepreneurship Development
2. NOE-072 Quality Management
3. NOE-073 Operations Research
4. NOE-074 Introduction to Bio Technology
5. NOE-075 Mobile Application Development
6. NOE-076 Ethical Hacking and Prevention
7. NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NCS-073 Computer Vision

Departmental Elective IV

1. NCS-07 4 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NIT-701 Cryptographic & Network Security

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-081 High Performance Computing
3. NCS-082 Real Time System
4. NCS-083 Cluster Computing
5. NCS-084 Grid Computing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-086 Quantum Computing
3. NCS-087 Embedded Systems
4. NCS-088 Semantic Web and Web Services

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5

Government policy for small scale industry; stages in starting a small scale industry. 2

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9

U NIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5

Role of various national and state agencies which render assistance to small scale industries. 2

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I
Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. 5
UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. 2
UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5
UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. 8
UNIT –V
ISO-9000 and its concept of Quality Management
7
ISO 9000 series, Taguchi method, JIT in some details.
Text / Reference Books:
1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.
UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.
UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.
UNIT-IV
Theory of Games :
Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poisson queuing model, single server models.
UNIT-V Inventory
Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipment’s that deteriorate with time, equipment’s that fail with time.

Text / Reference Books:

1. Wayne L. Winston, “Operations Research” Thomson Learning,2003.
2. Hamdy H. Taha, “Operations Research-An Introduction” Pearson Education,2003.
3. R. Panneer Seevam, “Operations Research” PHI Learning, 2008.
4. V.K.Khanna, “Total Quality Management” New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P

3 1 0

UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10

Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10

Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15

Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:

1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker's Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, "Ethical Hacking and Penetration Testing Guide" CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams "Gray Hat Hacking The Ethical Hakers Handbook." TMH
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson "HACKING, The art of Exploitation", William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077 L T P
3 1
0

UNIT-I:
Introduction and Software Project Planning5

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:
Project Organization and Scheduling 10
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
Project Monitoring and Control10
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:
Project Management and Project Management Tools10
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:
1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

DISTRIBUTED SYSTEMS

NCS-701 **L T P**
3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks.
Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.
Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System

model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

REFERENCES:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke,” Database Management Systems”, McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design”, Pearson Education
5. Tenanuanbaum, Steen,” Distributed Systems”, PHI

ARTIFICIAL INTELLIGENCE

NCS-702	L	T	P
	3	1	0

Unit-I **10**

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **10**

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **10**

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **10**

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V **5**

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

REFERENCES:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering: **10**
Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

Verification:
Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II

Functional Testing: **10**
Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing:
Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, CyclomaticComplexity, Data Flow Testing, Mutation Testing.

Unit-III

Regression Testing:: **10**
What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

Reducing the number of test cases:
Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV: **10**
Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing

Automated Test Data Generation:
Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V: **5**
Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

REFERENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010,Springer
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011 Springer
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998 Prentice Hall
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High SpeedLAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiandWiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.
REFERENCES:

1. William Stallings, "High speed networks and internet", Second Edition, PearsonEducation, 2002
2. Warland, PravinVaraiya, "High performance communication networks", SecondEdition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", CiscoPress, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band TelecommunicationNetworks", CRC Press, New York, 2004

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I **8**

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II **12**

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III 8

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV 8

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V8

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

REFERENCES:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076 **L T P**
3 1 0

UNIT I **10**
Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**
Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration
Choreography **-** Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**
Service oriented analysis – Business-centric SOA – Deriving business services- service modeling **-** Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**
SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**
WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

REFERENCES:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”,Pearson Education, 2005.
2. Newcomer, Lomow“ Understanding SOA with Web Services”, Pearson Education, 2005.
3. SandeepChatterjee, James Webber, “Developing Enterprise Web Services, AnArchitect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern,“ Enterprise SOA Designing IT for BusinessInnovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications:

Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

DISTRIBUTED SYSTEM LAB

NCS-751	**L**	**T**	**P**
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The following programs may be developed preferably on ‘UNIX’ platform:-A part from the above other problems may be given as per Course Instructor.

1. Simulate the functioning of Lamport’s Logical Clock in ‘C’.
2. Simulate the Distributed Mutual Exclusion in ‘C’.
3. Implement a Distributed Chat Server using TCP Sockets in ‘C’.
4. Implement RPC mechanism for a file transfer across a network in ‘C’
5. Implement ‘Java RMI’ mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in ‘C’.
7. Implement CORBA mechanism by using ‘C++’ program at one end and ‘Java program on the other.

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 **L T P**
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. 2

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. 3

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. 2

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. 2

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. 3

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International. 5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 **L T P**
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories. 8
UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7
UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems. 8
UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8
UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9
Reference Books:
1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 **L T P**
3 1 0

UNIT-1
Concept of Product, definition and scope.
Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.
UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
UNIT –III
Transformations, Brainstorming& Synetics, Morephological techniques.
Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.
Economic aspects, Fixed and variable costs, Break-even analysis.
UNIT-IV
Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.
UNIT-V
Existing techniques, such as work-study, SQC etc. for improving method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.
Text/Reference Books:
3. A.K. Chitab& R.C. Gupta "Product design & Manufacturing" – Prentice Hall (EE)
4. R.P. Crewford, "The Technology of creation Thinking" Prentice Hall.
5. C.D. Cain, "Product Design & Decision" Bussiness Books.
7. C.D. Cain, "Engg. Product Design" Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 **L T P**
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automat

Digital Image Processing

NCS-801

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UNIT-I
Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**
Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**
Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

REFERENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

PATTERN RECOGNITION

NCS-080 **L T P**
3 1 0

Unit-I

Introduction: **8**
Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: **8**
Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods: **12**
Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: **8**
Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: **8**
Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

HIGH PERFORMANCE COMPUTING

NCS-081 **L T P**
3 1 0

UNIT I **10**

Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.

UNIT II **10**

Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.

UNIT III **10**

Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,

UNIT IV **10**

Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).

UNIT V5

Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.

TOTAL: 45 PERIODS

REFERENCES:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, "Grid Computing: Practical Guide to Technology & Applications", Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , "Grid Computing" Pearson Education, 2004.
4. lan Foster, et al.,"The Open Grid Services Architecture", Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

REAL TIME SYSTEM

NCS-082 **L T P**
3 1 0

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

CLUSTER COMPUTING

NCS-083 **L T P**
3 1 0

UNIT I:

Basic concepts in Distributed Systems

Notion of time Distributed Mutual exclusion, Consensus, Failure models Paradigms for process interaction in distributed programs, Programming Paradigms, Shared memory, Message passing, Workflows

UNIT II:

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT III:

Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory,

UNIT IV:

Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT V:

System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

TOTAL: 45 PERIODS

REFERENCES:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, KaiHwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

GRID COMPUTING

NCS-084 **L T P**
3 1 0

UNIT I
CONCEPTS AND ARCHITECTURE 10
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II
GRID MONITORING 10
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III
GRID SECURITY AND RESOURCE MANAGEMENT 10
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV
DATA MANAGEMENT AND GRID PORTALS 10
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V
GRID MIDDLEWARE 5
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

REFERENCES:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality, Wiley
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.

DATA COMPRESSION

NCS-085 **L T P**
3 1 0

Unit - I: 10

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: 10

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: 10

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: 10

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: 5

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

REFERENCES:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning

3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING

NCS-086 **L T P**
3 1 0

UNIT I 10
FUNDAMENTAL CONCEPTS
Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II
QUANTUM COMPUTATION 10
Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III
QUANTUM COMPUTERS 10
Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

UNIT IV
QUANTUM INFORMATIONS 10
Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

UNIT V
QUANTUM ERROR CORRECTION 5
Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

TOTAL: 45 PERIODS

TEXT BOOK
1. Micheal A. Nielsen. &Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. DavidMermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

EMBEDDED SYSTEMS

NCS-087 **L T P**

3 1 0

Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088	**L**	**T**	**P**
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UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

Dr.A.P.J.Abdulkalam Technical University, UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

YEAR forth, SEMESTER –VII

(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NCS-701	Distributed System	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NCS-751	Distributed System *	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdul kalam Technical University,UttarPardesh,Lucknow

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STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

YEAR forth, SEMESTER –VIII

(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NCS-801	Digital Image Processing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practical's / Training /Projects									
5	NCS-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

Open Elective I

1. NOE-071 Entrepreneurship Development
2. NOE-072 Quality Management
3. NOE-073 Operations Research
4. NOE-074 Introduction to Bio Technology
5. NOE-075 Mobile Application Development
6. NOE-076 Ethical Hacking and Prevention
7. NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NCS-073 Computer Vision

Departmental Elective IV

1. NCS-07 4 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NIT-701 Cryptographic & Network Security

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-081 High Performance Computing
3. NCS-082 Real Time System
4. NCS-083 Cluster Computing
5. NCS-084 Grid Computing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-086 Quantum Computing
3. NCS-087 Embedded Systems
4. NCS-088 Semantic Web and Web Services

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5

Government policy for small scale industry; stages in starting a small scale industry. 2

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9

U NIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5

Role of various national and state agencies which render assistance to small scale industries. 2

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I
Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. 5
UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. 2
UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5
UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. 8
UNIT –V
ISO-9000 and its concept of Quality Management
7
ISO 9000 series, Taguchi method, JIT in some details.
Text / Reference Books:
1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.
UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.
UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.
UNIT-IV
Theory of Games :
Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poisson queuing model, single server models.
UNIT-V Inventory
Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:
1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel’s laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P

3 1 0

UNIT I

5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II

10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III

10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV

10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V

10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:
1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker’s Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide” CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams “Gray Hat Hacking The Ethical Hakers Handbook.” TMH
5. Patrick Engebretson, “The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson “HACKING, The art of Exploitation”, William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077 L T P
3 1
0

UNIT-I:
Introduction and Software Project Planning5

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:
Project Organization and Scheduling 10
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
Project Monitoring and Control10
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:
Project Management and Project Management Tools10
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:
1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

DISTRIBUTED SYSTEMS

	L	T	P
NCS-701	**3**	**1**	**0**

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks.
Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.
Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System

model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

REFERENCES:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

ARTIFICIAL INTELLIGENCE

NCS-702 **L T P**
3 1 0

Unit-I **10**
Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **10**
Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **10**
Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **10**
Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V **5**
Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering: **10**
Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

Verification:
Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II

Functional Testing: **10**
Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing:
Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, CyclomaticComplexity, Data Flow Testing, Mutation Testing.

Unit-III

Regression Testing:: **10**
What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

Reducing the number of test cases:
Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV: **10**
Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing

Automated Test Data Generation:
Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V: **5**
Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

REFERENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010,Springer
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011 Springer
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998 Prentice Hall
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8

Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High SpeedLAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiandWiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8

Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III12

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV8

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8

RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS

.

REFERENCES:

1. William Stallings, “High speed networks and internet”, Second Edition, PearsonEducation, 2002
2. Warland, PravinVaraiya, “High performance communication networks”, SecondEdition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. IrvanPepelnjk, Jim Guichard, Jeff Apcar, “MPLS and VPN architecture”, CiscoPress, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, “ATM Technology for Broad Band TelecommunicationNetworks”, CRC Press, New York, 2004

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I **8**

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II **12**

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III 8

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV 8

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V8

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

REFERENCES:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076 **L T P**
3 1 0

UNIT I **10**
Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**
Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration
Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**
Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**
SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**
WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

REFERENCES:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”,Pearson Education, 2005.
2. Newcomer, Lomow“ Understanding SOA with Web Services”, Pearson Education, 2005.
3. SandeepChatterjee, James Webber, “Developing Enterprise Web Services, AnArchitect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern,“ Enterprise SOA Designing IT for BusinessInnovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications:

Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

DISTRIBUTED SYSTEM LAB

NCS-751	**L**	**T**	**P**
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The following programs may be developed preferably on ‘UNIX’ platform:-A part from the above other problems may be given as per Course Instructor.

1. Simulate the functioning of Lamport’s Logical Clock in ‘C’.
2. Simulate the Distributed Mutual Exclusion in ‘C’.
3. Implement a Distributed Chat Server using TCP Sockets in ‘C’.
4. Implement RPC mechanism for a file transfer across a network in ‘C’
5. Implement ‘Java RMI’ mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in ‘C’.
7. Implement CORBA mechanism by using ‘C++’ program at one end and ‘Java program on the other.

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 **L T P**
3 1 0

UNIT-I
Introduction
Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4
UNIT-II
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9
UNIT-III Geothermal
Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations. 2
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations. 3
UNIT-IV
Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations. 2
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6
UNIT-V
Bio-mass:
Availability of bio-mass and its conversion theory. 2
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants. 3
Text/References Books:
1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International. 5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 **L T P**
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. 8
UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7
UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. 8
UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8
UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9
Reference Books:
1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 **L T P**
3 1 0

UNIT-1
Concept of Product, definition and scope.
Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.
UNIT –II
Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.
Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.
UNIT –III
Transformations, Brainstorming& Synetics, Morephological techniques.
Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.
Economic aspects, Fixed and variable costs, Break-even analysis.
UNIT-IV
Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.
Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.
Application of Computers in Product development & design.
UNIT-V
Existing techniques, such as work-study, SQC etc. for improving method & quality of product.
Innovation versus Invention. Technological Forecasting.
Use of Standards for Design.
Text/Reference Books:
3. A.K. Chitab& R.C. Gupta "Product design & Manufacturing" – Prentice Hall (EE)
4. R.P. Crewford, "The Technology of creation Thinking" Prentice Hall.
5. C.D. Cain, "Product Design & Decision" Bussiness Books.
7. C.D. Cain, "Engg. Product Design" Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 **L T P**
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.
Text/Reference Books:
1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automat

Digital Image Processing

NCS-801

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UNIT-I
Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**
Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**
Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

REFERENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

PATTERN RECOGNITION

NCS-080 **L T P**

3 1 0

Unit-I

Introduction: **8**

Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: **8**

Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods: **12**

Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: **8**

Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: **8**

Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

HIGH PERFORMANCE COMPUTING

NCS-081 **L T P**
3 1 0

UNIT I **10**
Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.

UNIT II **10**
Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.

UNIT III **10**
Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,

UNIT IV **10**
Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).

UNIT V5
Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.

TOTAL: 45 PERIODS

REFERENCES:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, “Grid Computing: Practical Guide to Technology & Applications”, Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004.
4. lan Foster, et al.,“The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

REAL TIME SYSTEM

NCS-082 | **L T P** | **3 1 0**

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

CLUSTER COMPUTING

NCS-083 | | L | T | P |
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UNIT I:

Basic concepts in Distributed Systems

Notion of time Distributed Mutual exclusion, Consensus, Failure models Paradigms for process interaction in distributed programs, Programming Paradigms, Shared memory, Message passing, Workflows

UNIT II:

Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT III:

Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory,

UNIT IV:

Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT V:

System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

TOTAL: 45 PERIODS

REFERENCES:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, KaiHwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

GRID COMPUTING

NCS-084

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UNIT I
CONCEPTS AND ARCHITECTURE 10
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II
GRID MONITORING 10
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III
GRID SECURITY AND RESOURCE MANAGEMENT 10
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV
DATA MANAGEMENT AND GRID PORTALS 10
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V
GRID MIDDLEWARE 5
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

REFERENCES:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality, Wiley
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.

DATA COMPRESSION

NCS-085 **L T P**
3 1 0

Unit - I: **10**
Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,
Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.
Unit – II: **10**
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.
Unit-III: **10**
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS
REFERENCES:
1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning
3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING

NCS-086 **L T P**
3 1 0

UNIT I 10
FUNDAMENTAL CONCEPTS
Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II
QUANTUM COMPUTATION 10
Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III
QUANTUM COMPUTERS 10
Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

UNIT IV
QUANTUM INFORMATIONS 10
Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

UNIT V
QUANTUM ERROR CORRECTION 5
Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

TOTAL: 45 PERIODS

TEXT BOOK

1. Micheal A. Nielsen. &Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. DavidMermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

EMBEDDED SYSTEMS

NCS-087 **L T P**

3 1 0

Unit-I **10**

Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II **10**

Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III **10**

Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.

Unit-IV **10**

Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V **5**

Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088 **L T P**

3 1 0

UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

Dr.A.P.J.Abdulkalam Technical University, UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME

B. TECH. COMPUTER SCIENCE & ENGINEERING

YEAR forth, SEMESTER –VII

(Effective from the session: 2016-17)

S.No.	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective I**	3-1-0	30	20	50	100	150	4
2	NCS-701	Distributed System	3-1-0	30	20	50	100	150	4
3	NCS-702	Artificial Intelligence	3-1-0	30	20	50	100	150	4
4		**Departmental Elective III**	3-1-0	30	20	50	100	150	4
5		**Departmental Elective IV**	3-1-0	30	20	50	100	150	4
Practical / Training /Projects									
6	NCS-751	Distributed System *	0-0-2	-	20	20	30	50	1
7	NCS-752	Project	0-0-6	-	100	100	-	100	3
8	NCS-753	Industrial Training	0-0-2	-	50	50	-	50	1
9	GP-701	General Proficiency	-	-	-	-	-	50	
		Total	15-5-10					1000	25

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

***** *At least 10 problems are to be considered based on corresponding theory course.*

Dr.A.P.J.Abdul kalam Technical University,UttarPardesh,Lucknow

(Formerly Uttar Pradesh Technical University)

STUDY EVALUATION SCHEME
B. TECH. COMPUTER SCIENCE & ENGINEERING
YEAR forth, SEMESTER –VIII
(Effective from the session: 2016-17)

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total	Credit
				Sessional			Exam		
				CT	TA	Total			
1		**Open Elective II**	3-1-0	30	20	50	100	150	**4**
2	NCS-801	Digital Image Processing	3-1-0	30	20	50	100	150	**4**
3		**Departmental Elective V**	3-1-0	30	20	50	100	150	**4**
4		**Departmental Elective VI**	3-1-0	30	20	50	100	150	**4**
Practical's / Training /Projects									
5	NCS-851	Seminar	0-0-3	-	50	50	-	50	**2**
6	NCS-852	Project	0-0-12	-	100	100	200	300	**7**
7	GP-801	General Proficiency	-	-	-	-	-	50	
		Total	12-4-15					1000	25

Open Elective I

1. NOE-071 Entrepreneurship Development
2. NOE-072 Quality Management
3. NOE-073 Operations Research
4. NOE-074 Introduction to Bio Technology
5. NOE-075 Mobile Application Development
6. NOE-076 Ethical Hacking and Prevention
7. NOE-077 Software Project Management

Open Elective II

1. NOE-081 Non Conventional Energy Resources
2. NOE-082 Non Linear Dynamics Systems
3. NOE-083 Product Development
4. NOE-084 Automation and Robotics

Departmental Elective III

1. NCS-071 Software Testing and Audit
2. NCS-072 Neural Network
3. NCS-073 Computer Vision

Departmental Elective IV

1. NCS-07 4 High Speed Network
2. NCS-075 Android Operating System
3. NCS-076 Service Oriented Architecture
4. NIT-701 Cryptographic & Network Security

Departmental Elective V

1. NCS-080 Pattern Recognition
2. NCS-081 High Performance Computing
3. NCS-082 Real Time System
4. NCS-083 Cluster Computing
5. NCS-084 Grid Computing

Departmental Elective VI

1. NCS-085 Data Compression
2. NCS-086 Quantum Computing
3. NCS-087 Embedded Systems
4. NCS-088 Semantic Web and Web Services

ENTREPRENEURSHIP DEVELOPMENT

NOE-071 L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. 5

Government policy for small scale industry; stages in starting a small scale industry. 2

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. 8

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. 9

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. 9

U NIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. 5

Role of various national and state agencies which render assistance to small scale industries. 2

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

QUALITY MANAGEMENT

NOE-072

L T P
3 1 0

UNIT-I
Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. 3
Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. 2
Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. 5
UNIT-II
Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. 3
Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. 2
UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. 5
Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. 5
UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. 8
UNIT –V
ISO-9000 and its concept of Quality Management
7
ISO 9000 series, Taguchi method, JIT in some details.
Text / Reference Books:
1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

OPERATIONS RESEARACH

NOE-073

L T P
3 1 0

UNIT-I
Introduction:
Definition and scope of operations research (OR), OR model, solving the OR model, art of modeling, phases of OR study.
Linear Programming:
Two variable Linear Programming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, sensitivity analysis.
UNIT-II
Transportation Problems:
Types of transportation problems, mathematical models , transportation algorithms,
Assignment:
Allocation and assignment problems and models, processing of job through machines.
UNIT-III
Network Techniques:
Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.
Project Management:
Phases of project management, guidelines for network construction, CPM and PERT.
UNIT-IV
Theory of Games :
Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.
Quality Systems:
Elements of Queuing model, generalized poisson queuing model, single server models.
UNIT-V Inventory
Control:
Models of inventory, operation of inventory system, quantity discount.
Replacement:
Replacement models: Equipment's that deteriorate with time, equipment's that fail with time.

Text / Reference Books:

1. Wayne L. Winston, "Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

INTRODUCTION TO BIOTECHNOLOGY

NOE-074 L T P

3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. 8

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. 7

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. 9

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. 9

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor
policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

MOBILE APPLICATION DEVELOPMENT

NOE-075 L T P
3 1 0

UNIT I
5

INTRODUCTION: Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

UNIT II
10

BASIC DESIGN: Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – User interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

UNIT III
10

ADVANCED DESIGN: Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

UNIT IV
10

TECHNOLOGY I – ANDROID: Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

UNIT V
10

TECHNOLOGY II – iOS: Introduction to Objective C – iOS features – UI implementation – Touch frameworks – Data persistence using Core Data and SQLite – Location aware applications using Core Location and Map Kit – Integrating calendar and address book with social media application – Using Wifi - iPhone marketplace. Swift: Introduction to Swift, features of swift.

TOTAL LECTURE: 45

REFERENCES:

1. Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
2. AnubhavPradhan , Anil V Despande Composing Mobile Apps,Learn ,explore,apply
3. James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
4. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
5. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6 Development: Exploring the iOS SDK”, Apress, 2013.

ETHICAL HACKING AND PREVENTION

NOE-076 L T P
3 1 0

Unit-I10

Ethical Hacking: Introduction, Networking & Basics, Foot Printing, Google Hacking, Scanning, Windows Hacking, Linux Hacking, Trojans & Backdoors, Virus & Worms,

Unit-II10
Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering System and Network Vulnerability and Threats to Security , Various types of attack and the various types of attackers in the context of the vulnerabilities associated with computer and information systems and networks Physical Security, Steganography,

Unit-III 10
Cryptography, Wireless Hacking, Firewall & Honeypots, IDS & IPS, Vulnerability, Penetration Testing, Session Hijacking, Hacking Web Servers, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow,

Unit-IV15
Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobile Phone Hacking Basic ethical hacking tools and usage of these tools in a professional environment. Legal, professional and ethical issues likely to face the domain of ethical hacking. Ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking.

TOTAL LECTURE: 45

REFERENCES:

1. Dominic Chell , Tyrone Erasmus, Shaun Colley, Oflie Whitehouse, The Mobile Application Hacker’s Handbook , Wiley
2. Michael Gregg, "Certified Ethical Hacker (CEH) Cert Guide", Pearson India, 2014
3. Rafay Baloch, “Ethical Hacking and Penetration Testing Guide” CRC Press
4. Allen Harper , Shome Harris, Jonathan Ness ,Chris Eagle, Gideon Lenkey,TerronVilliams “Gray Hat Hacking The Ethical Hakers Handbook.” TMH
5. Patrick Engebretson, “The Basics of Hacking and Penetration Testing, Second Edition:Ethical Hacking and Penetration Testing Made Easy, 2nd Edition, Elsevier
6. Jon Erickson “HACKING, The art of Exploitation”, William Pollock.

SOFTWARE PROJECT MANAGEMENT

NOE-077 L T P
3 1
0

UNIT-I:
Introduction and Software Project Planning5

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II:
Project Organization and Scheduling 10
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III:
Project Monitoring and Control10
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV:
Software Quality Assurance and Testing10

Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V:
Project Management and Project Management Tools10
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

TOTAL LECTURE: 45

REFERENCES:
1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.
5. Harold R. Kerzner, Project Mangment "A Systems Approach to Planning, Scheduling, and Controlling" Wiley.
6. Mohapatra, Software Project Management, Cengage Learning.

DISTRIBUTED SYSTEMS

NCS-701 **L T P**
3 1 0

Unit–I **10**

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.
Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks ,Lamport's& vectors logical clocks.
Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II **10**

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.
Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlockprevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III **10**

Agreement Protocols: Introduction, System models, classification of Agreement Problem,Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.
Distributed Resource Management: Issues in distributed File Systems, Mechanism for buildingdistributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory.

Unit–IV **10**

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recoveryin Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.
Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamicvotingprotocols.

Unit –V5

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, OptimisticConcurrency control, Timestamp ordering, Comparison of methods for concurrency control.
Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols,Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System

model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

TOTAL LECTURE: 45

REFERENCES:

1. Singhal&Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", McGraw Hill
3. Vijay K.Garg Elements of Distributed Compuitng , Wiley
4. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
5. Tenanuanbaum, Steen," Distributed Systems", PHI

ARTIFICIAL INTELLIGENCE

NCS-702 **L T P**
3 1 0

Unit-I **10**
Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II **10**
Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III **10**
Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV **10**
Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V **5**
Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

TOTAL LECTURE: 45

REFERENCES:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", Pearson Education
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", McGraw-Hill
3. E Charniak and D McDermott, "Introduction to Artificial Intelligence", Pearson Education
4. Dan W. Patterson, "Artificial Intelligence and Expert Systems", Prentice Hall of India,

SOFTWARE TESTING AND AUDIT

NCS-071 **L T P**
3 1 0

Unit-I

Review of Software Engineering: **10**
Overview of software evolution, SDLC, Testing Process, Terminologies in Testing: Error, Fault, Failure, Verification, Validation, Difference between Verification and Validation, Test Cases, Testing Suite, Test Oracles, Impracticality of Testing All data; Impracticality of testing AllPaths.

Verification:
Verification methods, SRS verification, Source code reviews, User documentation verification, Software project audit, Tailoring Software Quality Assurance Program by Reviews, Walkthrough, Inspection, and Configuration Audits.

Unit –II
Functional Testing: **10**
Boundary Value Analysis, Equivalence Class Testing, Decision Table Based Testing, Cause Effect Graphing Technique.

Structural Testing:
Control flow testing, Path testing, Independent paths, Generation of graph from program, Identification of independent paths, CyclomaticComplexity, Data Flow Testing, Mutation Testing.

Unit-III
Regression Testing:: **10**
What is Regression Testing? Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization technique.

Reducing the number of test cases:
Prioritization guidelines, Priority category, Scheme, Risk Analysis.

Unit-IV: **10**
Software Testing Activities: Levels of Testing, Debugging, Testing techniques and theirApplicability, Exploratory Testing

Automated Test Data Generation:
Test Data, Approaches to test data generation, test data generation using genetic algorithm, Test Data Generation Tools, Software Testing Tools, and Software test Plan.

Unit-V: **5**
Object oriented Testing: Definition, Issues, Class Testing, Object Oriented Integration and System Testing.

Testing Web Applications: What is Web testing?, User interface Testing, Usability Testing, Security Testing, Performance Testing, Database testing, Post Deployment Testing. **(8 hrs)**

TOTAL LECTURE: 45

REFERENCES:

1. Yogesh Singh, “Software Testing”, Cambridge University Press, New York, 2012
2. K..K. Aggarwal&Yogesh Singh, “Software Engineering”, New Age International Publishers, New Delhi, 2003.
3. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Fifth Edition, McGraw-Hill International Edition, New Delhi,2001.
4. Marc Roper, “Software Testing”, McGraw-Hill Book Co., London, 1994.
5. Boris Beizer, “Software System Testing and Quality Assurance”, Van NostrandReinhold, New York, 1984.

NEURAL NETWORKS

NCS-072 **L T P**
3 1 0

Unit-I:
Neuro Computing and Neuroscience **10**
Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsupervised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:
Data processing **10**
Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values &eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.
Unit-III **10**
Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.
Unit-IV **10**
Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.
Unit-V **5**
Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

TOTAL LECTURE: 45

REFERENCES:

1. J.A. Anderson, An Introduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. Laurene V. Fausett, "Fundamentals of Neural Networks : Architectures, Algorithms and Applications", Pearson India
4. Kosko, Neural Network and Fuzzy Sets, PHI
5. Hagan, Neural Network Design w/CD,Cengage Learning

COMPUTER VISION

NCS-073 **L T P**
3 1 0

UNIT 1
IMAGE FORMATION MODEL **10**
Monocular Imaging System, Orthographic & Perspective Projection, Camera model and Camera calibration , Binocular imaging systems

UNIT 2
IMAGE PROCESSING AND FEATURE EXTRACTION **10**
Image representations (continuous and discrete), Edge detection

UNIT3
MOTION ESTIMATION **5**
Regularization Theory, Optical Computation, Stereo Vision, Motion Estimation, Structure from Motion.

UNIT 4
SHAPE REPRESENTATION AND SEGMENTATION **10**
Shape Representation and Segmentation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and Wavelet Descriptors, Medial Representations ,Multiresolution analysis

UNIT 5
OBJECT RECOGNITION **10**
Hough transforms and other simple object recognition Methods, Shape Correspondence and Shape Matching, Principal component analysis , Shape priors for recognition

TOTAL LECTURE: 45

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, 2010,Springer
2. Forsyth and Ponce, Computer Vision, A Modern Approach, 2nd ed., 2011 Springer
3. Trucco and Verri, Introductory Techniques for 3D Computer Vision, 1998 Prentice Hall
4. David A. Forsyth, "Computer Vision: : A Modern Approach", 2nd Edn, Pearson India 2015

HIGH SPEED NETWORKS

NCS-074 **L T P**
3 1 0

UNIT I 8
Frame Relay Networks – Asynchronous transfer mode–ATM Protocol Architecture,ATM logical Connection – ATM Cell – ATM Service Categories – AAL. High SpeedLAN's: Fast Ethernet – Gigabit Ethernet– Fiber Channel – Wireless LAN's, WiFiandWiMax Networks applications, requirements – Architecture of 802.11.

UNIT II 8
Queuing Analysis – Queuing Models – Single Server Queues – Effects of Congestion –Congestion Control – Traffic Management – Congestion Control in Packet Switching Networks – Frame Relay Congestion Control.

UNIT III12
TCP Flow control – TCP Congestion Control – Retransmission – Timer Management –Exponential RTO backoff – KARN's Algorithm – Window management – Performance ofTCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes –Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR ratecontrol, RM cell formats – ABR Capacity allocations – GFR traffic management.

UNIT IV8
Integrated Services Architecture – Approach, Components, Services- Queuing Discipline– FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services.

UNIT V 8
RSVP – Goals & Characteristics, Data Flow, RSVP operations – Protocol Mechanisms– Multiprotocol Label Switching – Operations, Label Stacking – Protocol details – RTP– Protocol Architecture – Data Transfer Protocol– RTCP.

TOTAL: 44 PERIODS
.
REFERENCES:

1. William Stallings, "High speed networks and internet", Second Edition, PearsonEducation, 2002
2. Warland, PravinVaraiya, "High performance communication networks", SecondEdition , Jean Harcourt Asia Pvt. Ltd., , 2001
3. IrvanPepelnjk, Jim Guichard, Jeff Apcar, "MPLS and VPN architecture", CiscoPress, Volume 1 and 2, 2003.
4. Abhijit S. Pandya, Ercan Sea, "ATM Technology for Broad Band TelecommunicationNetworks", CRC Press, New York, 2004

ANDROID OPERATING SYSTEM

NCS-075 **L T P**
3 1 0

UNIT I **8**

Android OS

Android Software Stack, Activities and Applications, Activity Life Cycles, Activity Stacks, Activity States, Resources, Android OS vs. IOS

UNIT II **12**

User Interfaces

Views, Layouts, Android Widgets, UI XML Specifications, Explicit Intents, Implicit Intents, Event Broadcasting with Intents, Event Reception with Broadcast Receivers, Adapters and Data Binding.

UNIT III 8

Multimedia

Audio, Video, Camera, Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

UNIT IV 8

Networking

Internet Access, HTML and XML Parsing, Wi-Fi

UNIT V8

Touchscreen

Capturing Touch Events, Touchscreen Gesture Recognition

TOTAL: 44 PERIODS

REFERENCES:

1. Rito Meier. "Professional Android 2 Application Development." Wiley Publishing, Inc.
2. SayedHashimi, SatyaKomatineni, Dave MacLean. "Pro Android 2." APRESS.
3. Mark Murphy. "Beginning Android 2." APRESS.
4. Carmen Delessio,LaurenDarcey ”Android Application Development” Pearson
5. J.F.DiMarzio “Android a programming guide” TMH

SERVICE ORIENTED ARCHITECTURE

NCS-076	**L**	**T**	**P**
	3	**1**	**0**

UNIT I **10**

Roots of SOA – Characteristics of SOA - Comparing SOA to client-server and distributed internet architectures – Anatomy of SOA- How components in an SOA interrelate -Principles of service orientation

UNIT II **10**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration
Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer

UNIT III **10**

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – WSDL basics – SOAP basics – SOA composition guidelines – Entity-centric business service design – Application service design – Taskcentric business service design

UNIT IV **10**

SOA platform basics – SOA support in J2EE – Java API for XML-based web services (JAX-WS) - Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) - Java API for XML based RPC (JAX-RPC)- Web Services Interoperability Technologies (WSIT) - SOA support in .NET – Common Language Runtime - ASP.NET web forms – ASP.NET web services – Web Services Enhancements (WSE).

UNIT V **5**

WS-BPEL basics – WS-Coordination overview - WS-Choreography, WS-Policy, WSSecurity

TOTAL: 45 PERIODS

REFERENCES:

1. Thomas Erl, “Service-Oriented Architecture: Concepts, Technology, andDesign”,Pearson Education, 2005.
2. Newcomer, Lomow“ Understanding SOA with Web Services”, Pearson Education, 2005.
3. SandeepChatterjee, James Webber, “Developing Enterprise Web Services, AnArchitect’s Guide”, Pearson Education, 2005.
4. Dan Woods and Thomas Mattern,“ Enterprise SOA Designing IT for BusinessInnovation” O’REILLY, First Edition, 2006
5. Kambhampaty Service Oriented Architecture for Enterprise and cloud applications , Wiley

CRYPTOGRAPHY & NETWORK SECURITY

NIT-701 **L T P**
3 1 0

Unit-I **10**

Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.
Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II **10**

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,
Advanced Encryption Standard (AES) encryption and decryptionFermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem,Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III **10**

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)
Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV **10**

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.
Authentication Applications:
Kerberos, Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V **10**

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.
Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

TOTAL: 45 PERIODS

REFERENCES:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
4. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
5. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
6. AtulKahate, "Cryptography and Network Security", Tata McGraw Hill

DISTRIBUTED SYSTEM LAB

NCS-751	**L**	**T**	**P**
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The following programs may be developed preferably on 'UNIX' platform:-A part from the above other problems may be given as per Course Instructor.

1. Simulate the functioning of Lamport's Logical Clock in 'C'.
2. Simulate the Distributed Mutual Exclusion in 'C'.
3. Implement a Distributed Chat Server using TCP Sockets in 'C'.
4. Implement RPC mechanism for a file transfer across a network in 'C'
5. Implement 'Java RMI' mechanism for accessing methods of remote systems.
6. Simulate Balanced Sliding Window Protocol in 'C'.
7. Implement CORBA mechanism by using 'C++' program at one end and 'Java program on the other.

NON-CONVENTIONAL ENERGY RESOURCES

NOE-081 **L T P**

3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. 3

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. 9

UNIT-III Geothermal

Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. 4

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. 2

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. 3

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. 2

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. 6

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. 2

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.

Waste Recycling Plants. 3

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.

2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.

3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.

4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International. 5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NON-LINEAR DYNAMIC SYSTEMS

NOE-082 **L T P**
3 1 0

UNIT-I
Dynamic systems:
Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.
Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. 8

UNIT-II
STABILITY-I:
Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. 7

UNIT-III
Stability-II
Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. 8

UNIT-IV
Bifurcation:
Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. 8

UNIT-V
Chaos:
Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. 9

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

PRODUCT DEVELOPMENT

NOE- 083 **L T P**
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)

4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.

5. C.D. Cain, “Product Design & Decision” Bussiness Books.

7. C.D. Cain, “Engg. Product Design” Bussiness Books.

AUTOMATION AND ROBOTICS

NOE-084 **L T P**
3 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.
2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,
and introduction to robot vision.
5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automat

Digital Image Processing

NCS-801

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UNIT-I
Introduction and Fundamentals **10**

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II **10**
Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration **10**

A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV **10**
Morphological Image Processing

Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration **5**

Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation

Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

TOTAL: 45 PERIODS

REFERENCES:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.
4. Sonka, Digital Image Processing and Computer Vision, Cengage Learning
5. Gonzalez and Woods, Digital Image Processing, Addison Wesley.

PATTERN RECOGNITION

NCS-080 **L T P**
3 1 0

Unit-I

Introduction: 8

Basics of pattern recognition, Design principles of pattern recognition system,Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: 8

Bayesian Decision Theory, Classifiers, Normal density anddiscriminant functions,

Unit – III

Parameter estimation methods: 12

Maximum-Likelihood estimation, Bayesian Parameterestimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: 8

Density Estimation, Parzen Windows, K-Nearest NeighborEstimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: 8

Criterion functions for clustering, Clustering Techniques:Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

TOTAL: 44 PERIODS

REFERENCES:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, Academic Press, 2009.

HIGH PERFORMANCE COMPUTING

NCS-081 **L T P**
3 1 0

UNIT I **10**

Overview of Grid Computing Technology, History of Grid Computing, High Performance Computing, Cluster Computing. Peer-to-Peer Computing, Internet Computing, Grid Computing Model and Protocols, Types of Grids: Desktop Grids, Cluster Grids, Data Grids, High- Performance Grids, Applications and Architectures of High Performance Grids, High Performance Application Development Environment.

UNIT II **10**

Open Grid Services Architecture, Introduction, Requirements, Capabilities, Security Considerations, GLOBUS Toolkit.

UNIT III **10**

Overview of Cluster Computing, Cluster Computer and its Architecture, Clusters Classifications, Components for Clusters, Cluster Middleware and SSI, Resource Management and Scheduling, Programming, Environments and Tools, Cluster Applications, Cluster Systems,

UNIT IV **10**

Beowulf Cluster: The Beowulf Model, Application Domains, Beowulf System Architecture, Software Practices, Parallel Programming with MPL, Parallel Virtual Machine (PVM).

UNIT V5

Overview of Cloud Computing, Types of Cloud, Cyber infrastructure, Service Oriented Architecture Cloud Computing Components: Infrastructure, Storage, Platform, Application, Services, Clients, Cloud Computing Architecture.

TOTAL: 45 PERIODS

REFERENCES:

1. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
2. Ahmar Abbas, “Grid Computing: Practical Guide to Technology & Applications”, Firewall Media, 2004.
3. Joshy Joseph and Craig Fellenstein , “Grid Computing” Pearson Education, 2004.
4. lan Foster, et al.,“The Open Grid Services Architecture”, Version 1.5 (GFD.80). Open Grid Forum, 2006.
5. Ian Foster. Globus Tool kit Version 4: Software for Service-Oriented Systems. IFIP International Conference on Network and Parallel Computing, Springer- Verlag LNCS 3779, pp 2-13,2006
6. RajkumarBuyya. High Performance Cluster Computing: Architectures and Systems. Prentice-Hall India, 1999.

REAL TIME SYSTEM

NCS-082 **L T P**
3 1 0

UNIT-I:
Introduction **5**
Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II:
Real Time Scheduling **10**
Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III:
Resources Sharing **10**
Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV:
Real Time Communication **10**
Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V:
Real Time Operating Systems and Databases **10**
Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Characteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

TOTAL: 45 PERIODS

REFERENCES:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Phillip A Laplanta,SeppoJ.Ovaska Real time System Design and Analysis Tools for practitioner, Wiley
3. Mall Rajib, “Real Time Systems”, Pearson Education
4. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

CLUSTER COMPUTING

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NCS-083	**3**	**1**	**0**

UNIT I:
Basic concepts in Distributed Systems
Notion of time Distributed Mutual exclusion, Consensus, Failure models Paradigms for process interaction in distributed programs, Programming Paradigms, Shared memory, Message passing, Workflows

UNIT II:
Introduction to Cluster Computing, Cluster Middleware: An Introduction, Early Cluster Architecture and High Throughput Computing Clusters, Networking, Protocols and I/O for Clusters, Setting Up and Administering a Cluster

UNIT III:
Cluster Technology for High Availability, Performance Models and Simulation, Process Scheduling, Load Sharing and Load Balancing, Distributed Shared Memory,

UNIT IV:
Introduction to Grid Architecture, Characterization of Grid, and Grid related standard bodies, Grid types, Topologies, Components and Layers, Comparison with other approaches.

UNIT V:
System Infrastructure, Traditional paradigms for distributed computing, Web Services, Grid standards: OGSA and WSRF, Case Studies of Cluster Systems: Beowulf, COMPaS, NanOS and PARAM

TOTAL: 45 PERIODS

REFERENCES:

1. Grid and Cluster Computing, Prabhu C.S.R, PHI Learning Private Limited
2. A networking Approach To Grid Computing by Daniel Minoli (Chapter 1) (John Wiley and Sons, INC Publication)
3. Distributed and Cloud Computing, First Edition, Geoffrey C. Fox, KaiHwang, Jack J. Dongarra, Elsevier India Pvt. Ltd.-New Delhi
4. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality
5. High Performance Cluster Computing: Architectures and Systems, Vol. 1, Prentice Hall
6. In search of clusters (2nd ed.), Gregory F. Pfister, IBM, Austin, TX, Prentice-Hall

GRID COMPUTING

NCS-084

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UNIT I
CONCEPTS AND ARCHITECTURE 10
Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing- Anatomy and Physiology of Grid-Review of Web Services-OGSA-WSRF.

UNIT II
GRID MONITORING 10
Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- GridICE – JAMM - MDS-Network Weather Service-R-GMA-Other Monitoring Systems- Ganglia and GridMon

UNIT III
GRID SECURITY AND RESOURCE MANAGEMENT 10
Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management-Scheduling Paradigms- Working principles of Scheduling -A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT IV
DATA MANAGEMENT AND GRID PORTALS 10
Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective, Data Management Services-Federation Services-Grid Portals-First-Generation Grid Portals-Second-Generation Grid Portals.

UNIT V
GRID MIDDLEWARE 5
List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features

TOTAL: 45 PERIODS

REFERENCES:

1. JoshyJoseph, CraigFellenstein—Grid Computing, Pearson Education, 2004.
2. Vladimir Silva—Grid Computing for Developers,DreamtechPress, 2006.
3. Fran Berman, Geoffrey C. Fox, Anthony J.G Hey Grid Computing making the global infrastructure a Reality, Wiley
4. AhmarAbbas--Grid Computing —A Practical Guide to Technology and Applications, Firewall Media, 2006.

DATA COMPRESSION

NCS-085 **L T P**
3 1 0

Unit - I: **10**

Compression Techniques: Loss less compression, Lossy Compression, Measures of performance, Modeling and coding, Mathematical Preliminaries for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II: **10**

The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III: **10**

Coding a sequence, Generating a binary code, Comparison of Binary and Huffman coding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV: **10**

Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V: **5**

Advantages of Vector Quantization over Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured VectorQuantizers.

TOTAL: 45 PERIODS

REFERENCES:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers
2. Elements of Data Compression,Drozdek, Cengage Learning

3. Introduction to Data Compression, Second Edition,KhalidSayood,The Morgan aufmannSeries
4.Data Compression: The Complete Reference 4th Edition byDavid Salomon, Springer
5.Text Compression1st Edition by Timothy C. Bell Prentice Hall

QUANTUM COMPUTING

NCS-086 **L T P**
3 1 0

UNIT I 10
FUNDAMENTAL CONCEPTS
Global Perspectives, Quantum Bits, Quantum Computation, Quantum Algorithms, Quantum Information, Postulates of Quantum Mechanisms.

UNIT II
QUANTUM COMPUTATION 10
Quantum Circuits – Quantum algorithms, Single Orbit operations, Control Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier transform, Phase estimation, Applications, Quantum search algorithms – Quantum counting – Speeding up the solution of NP – complete problems – Quantum Search for an unstructured database.

UNIT III
QUANTUM COMPUTERS 10
Guiding Principles, Conditions for Quantum Computation, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer – Optical cavity Quantum electrodynamics, Ion traps, Nuclear Magnetic resonance.

UNIT IV
QUANTUM INFORMATIONS 10
Quantum noise and Quantum Operations – Classical Noise and Markov Processes, Quantum Operations, Examples of Quantum noise and Quantum Operations – Applications of Quantum operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum information.

UNIT V
QUANTUM ERROR CORRECTION 5
Introduction, Shor code, Theory of Quantum Error –Correction, Constructing Quantum Codes, Stabilizer codes, Fault – Tolerant Quantum Computation, Entropy and information – Shannon Entropy, Basic properties of Entropy, Von Neumann, Strong Sub Additivity, Data Compression, Entanglement as a physical resource.

TOTAL: 45 PERIODS

TEXT BOOK

1. Micheal A. Nielsen. &Issac L. Chiang, “Quantum Computation and Quantum Information”, Cambridge University Press, Fint South Asian edition, 2002.
2. Eleanor G. Rieffel , Wolfgang H. Polak , “Quantum Computing - A Gentle Introduction” (Scientific and Engineering Computation) Paperback – Import, 3 Oct 2014
3. Computing since Democritus by Scott Aaronson
4. Computer Science: An Introduction by N. DavidMermin
5. Yanofsky's and Mannucci, Quantum Computing for Computer Scientists.

EMBEDDED SYSTEMS

NCS-087 **L T P**
3 1 0

Unit-I **10**
Introduction to embedded systems: Classification, Characteristics and requirements, Applications
Unit-II **10**
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.
Unit-III **10**
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.Modeling and Characterization of Embedded Computation System.
Unit-IV **10**
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.
Unit-V **5**
Fault-Tolerance, FormalVerification , Trends in Embedded Processor, OS,Development Language

References:

1. Prasad, Embedded /Real Time System,Concept,Design and Programming Black Book, Wiley India
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

SEMANTIC WEB AND WEB SERVICES

NCS-088 **L T P**
3 1 0

UNIT I **12**

Introduction to Semantic Web: History of Semantic Web, goals and vision, problems, Semantic Web Technologies, Layered Approach, Syntactic vs semantic web, Applications of semantic web.

UNIT II **8**

Architecture: XML with Document Type Definitions and Schema, addressing and querying XML documents, RDF (Resource Description Framework), basic idea and syntax, quering in RQL, URI**(8 Hrs.)**

UNIT III **8**

Ontologies: Role of Ontology in intelligent information retrieval on web, OWL, Ontologies for different applications. Ontology engineering: constructing ontologies manually, reusing existing ontologies.

UNIT IV **8**

Semantics: Kinds of semantics, use of semantics, Search Engines: Role of search Engines in intelligent retrieval of information on web, Semantic web browsers.

UNIT V **8**

Logic and inference: examples of Monotonic rules: family relationships, monotonic rules: syntax and semantics, Non-monotonic rules: Motivation and syntax, Non-monotonic rule example: and Brokered Trade, Rule Mark-up XML: Monotonic and Non-Monotonic rules.**(8 Hrs.)**

References:-

1. Salam, A. F., ed. SemanticWeb Technologies and E-Business: Toward the Integrated Virtual Organization and Business Process Automation:. IGI Global, 2006.
2. Cardoso, Jorge, ed. Semantic Web Services: Theory, Tools and Applications: Theory, Tools and Applications. IGI Global, 2007.
3. Antoniou, Grigoris, and Frank Van Harmelen. A semantic web primer. MIT press, 2004.
4. Pascal Hitzler, Markus Krotzsch, Sebastian Rudolph, Foundations of Semantic Web Technologies, CRC Press
5. Daconta, Michael C., Leo J. Obrst, and Kevin T. Smith. The semantic web: a guide to the future of XML, web services, and knowledge management. John Wiley & Sons, 2003.

Dr. A.P. J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

4th Year

[Effective from session 2016-17]

B. Tech. Civil Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE071-NOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	NCE031-NCE035	Department Elective-III	3	1	0	30	20	50	100	150	4
3	NCE041-NCE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	NCE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	NCE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	NCE751	Seminar	0	0	4		-	50	-	50	1
7	NCE752	Industrial Training**					-	50	-	50	1
8	NCE753	Project#	0	0	4		-	100	-	100	3
9	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

Departmental Elective-3 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 031 - Bridge Engineering
2 (B)	NCE 032 - Finite Element Methods
2(C)	NCE 033 - Environmental Geo-technology
2(D)	NCE 034 - Industrial Pollution Control & Env. Audit
2 (E)	NCE 035 – Engineering Hydrology

Departmental Elective-4 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE 041 - Precast and Modular Construction Practices
3 (B)	NCE 042 - Plastic Analysis of Structures
3 (C)	NCE 043 - Open Channel Flow
3 (D)	NCE 044 – Tunnel Engineering

Dr. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2016-17

Final Year, VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE081-NOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	NCE051-NCE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	NCE061-NCE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	NCE801	Transportation Engineering -II	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	NCE851	Project	0	0	12		100	100	250	350	8
6	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24

Departmental Elective-5 (Full Unit Course with Credit: 4)

S. No.	Code and Course
2 (A)	NCE 051 - Computer Aided Design
2 (B)	NCE 052 - Analysis and Design of Hydraulic Structures
2 (C)	NCE 053 - Water Resources Systems
2 (D)	NCE 054 - Machine Foundation Design

Departmental Elective-6 (Full Unit Course with Credit: 4)

S. No.	Code and Course
3 (A)	NCE061 - Ground Improvement Techniques
3 (B)	NCE 062 - River Engineering
3 (C)	NCE 063 – Groundwater Management
3 (D)	NCE 064 - Earthquake Resistant Design of Structures

List of Open Electives for B. Tech. Courses

<u>OPEN ELECTIVE-I</u>

NOE -071	Entrepreneurship Development
NOE-072	Quality Management
NOE-073	Operations Research
NOE-074	Introduction to Biotechnology

<u>OPEN ELECTIVE-II</u>

NOE-081	Non Conventional Energy Resources
NOE-082	Nonlinear Dynamic Systems
NOE-083	Product Development
NOE-084	Automation & Robotics

NCE-701 Design of Steel Structures

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria 8

Unit -2

Simple Connections-–Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections**,** Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections .

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections, Working Load Design. 8

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design. 8

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. 8

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. 8

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin , CENGAGE Learning

NCE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data,
consistency of rainfall records, Intensity during frequency (IDF) and probabilitic maximum Precipitation (PMP) curves.
Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.
Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices. 8

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.
Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses. 8

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation
Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, Longitudinal cross section, Schedule of area
statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programs for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains. 8

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge. 8

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries. 8

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

References

1. Water Resources Engg. By Larry W. Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R. K. Linsley, McGraw Hill
4. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Theory and practices by A.M. Michel.
6. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.

NCE - 801 TRANSPORTATION ENGINEERING - II

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT –I

Introduction, Permanent Way and Components:

History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. 8

UNIT-II

Track Geometrics, Turnouts and Crossings, Stations and Yards:

Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning. 8

UNIT –III

Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. 8

UNIT – 4

Introduction to Airport Engineering

Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. 8

UNIT – 5

Water Transport

Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses.

Inland waterways: advantages and disadvantages; Development in India. Inland water operation. 8

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

NCE 031 Bridge Engineering

L T P
3 1 0

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method, 8

Unit – 2

Courbon's method of load distribution. Detail design of Reinforced Concrete slab culvert 8

Unit – 3

T-beam bridge, box culverts, 8

Unit – 4

Design elements of plate girder, economical section and design. 8

Unit – 5

Design of piers, pier caps and Abutments, different types of bearings & its design 8

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra
4. Bridge Engineering by S.Ponnusway
5. Principles & Practices of Bridge Engineering by S.P. Bindra
6. Bridge Engineering (An integrated Treatise) by V.V. Sastry

NCE 032 Finite Element Methods

L T P
3 1 0

Unit - 1

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. 8

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. 10

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix.

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, 8

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. 8

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. 6

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication.
5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

NCE 033 Environmental Geotechnology

L T P
3 1 0

Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems. 8

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination 8

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems. 8

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action 8

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills. 8

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics
4. Environmental & Geotechniques by Robert W. Sarsby
5. Geostatics for Environmental & geotechnical Publication Shahrukh Rouhanvy

NCE – 034 Industrial Pollution Control and Environmental Audit

L T P
3 1 0

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial processes requiring water use and water quality. 8

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent. 8

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management. 8

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc. 8

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000. 8

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes.* Edmund, B. Besselieve P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use.* Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook.* Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering.* Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986.* Any authorized & recent publication on Government Acts.
9. Industrial Pollution Control and Environmental Audit by Sanjay Gupta

NCE-035 : Engineering Hydrology

L T P
3 1 0

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation. 8

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation 8

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. 8

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. 8

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting. 8

Recommended Books:

- *'Hydrology for Engineers' by Linsley R. K., Kohler M. A. and Paulhus J. L. H.*
- *'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education*
- *'Hydrology: Principles. Analysis. Design' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- '*Engineering Hydrology' by Ojha, Oxford University Press*.
- *'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.*
- *'Applied Hydrology' by Fetter, by Pearson Publication.*

NCE- 041 Precast and Modular Construction Practices

L T P
3 1 0

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components, 8

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance, 8

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability, 8

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.8

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction. 8

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

NCE – 042 Plastic Analysis of Structures

L T P
3 1 0

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor. 8

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames. 8

Unit – 3

Semi Graphical method and Mechanism method. 8

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames. 8

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear. 8

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

NCE- 043 : Open Channel Flow

L T P
3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions. 8

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels. 8

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, "Celerity" of the gravity wave, deep and shallow water waves, open channel positive and negative surge, 8

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack. 8

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert. 8

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International
7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

NCE 044 - Tunnel Engineering

L T P
3 1 0

Unit – 1

Site investigations , Geotechnical Considerations of tunneling 8

Unit – 2

Design of Tunnels 8

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels 8

Unit-4

Micro tunneling techniques , Tunnel support design 8

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects 8

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski
3. Harbour & Dock & Tunnel by R. Srinivasan
4. Tunnel Engineering by S.C. Saxena

NCE – 051 COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works. 8

UNIT – 2

Principles of software design, concept of modular programming, debugging and testing. 8

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems. 8

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields. 8

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks. 8

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lerine & / Lane E. Drang, McGraw Hill
3. "Neural Computing: Waserman, vonnostrand.
4. Auto Cadd 2013 Dummes Bill Fane

5.Cad Frame & Architechture by Pieter Van Der Wolf

NCE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L T P
3 1 0

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis tall.

Principle and design of Distributory head regulatior and cross regulator, canal escape, Bed bars. 8

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. 8

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method.

Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis. 8

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks. 8

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability. Power House layout and important structures of a powerhouse. 8

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers
6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

NCE 053 WATER RESOURCES SYSTEMS

L T P
3 1 0

Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis. 8

Unit-II

System Techniques in Water Resources: Optimization using calculas, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization. 8

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis 8

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection. 8

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation. 8

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, V^{th} Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elesvier, Amsterdam
5. Water Resource System by Subhash Chander & Rajesh k Prasad
6. Water Resource System by PR Bhave

NCE 054 Machine Foundation Design

L T P
3 1 0

Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped. 8

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken’s approach, Ford & Haddow’s analysis, Hammer foundation, I. S. Codes. 8

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments 8

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers. 8

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers. 8

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations
4. Foundation for Industrial Machine by R.G. Bhatia

NCE 061 Ground Improvement Techniques

L T P
3 1 0

Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. 8

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. 8

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. 8

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. 8

Unit -5

Underpining of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage. 8

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

NCE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. 8

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. 8

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. 8

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data. 8

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. 8

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson

4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

NCE-063: Groundwater Management

L T P
3 1 0

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium. 8

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters, 8

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation. 8

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage, 8

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge. 8

Recommended References:

- *'Groundwater Hydrology' by Todd D. K.*
- *'Groundwater Resource Evaluation' by Walton W. C.*
- *'Groundwater' by Raghunath H. M.*
- *'Handbook of Applied Hydrology' by Chow V. T.*
- *'Irrigation: Theory & Practice' by Michael A. M.*
- *'Groundwater' by S.Ramakrishnan*

NCE – 064 EARTHQUAKE RESISTANT DESIGN

L T P
3 1 0

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, 8

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, 8

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, seismic response, 8

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. 8

Unit – 5

Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. 8

References:

1. Introduction to Structural Dynamics - J.M. Biggs

2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries
and sub-control types. **5**
Government policy for small scale industry; stages in starting a small scale industry. **2**

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods. **8**

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation
of financial reports, accounts and stores studies. **9**

UNIT -IV

Project Planning and control:
The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication. **9**

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes
and workman compensation act. **5**
Role of various national and state agencies which render assistance to small scale industries. **2**

Text / Reference Books:

1. Forbat, John, "Entrepreneurship" New Age International.
2. Havinal, Veerbhadrappa, "Management and Entrepreneurship" New Age International
3. Joseph, L. Massod, "Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type. **3**

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure. **2**

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and
services, guarantee, analysis of claims. **5**

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program. **3**

Human Factor in quality
Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of
apparatus error and corrective methods. **2**

UNIT-III Control
Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts. **5**

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts. **5**

UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability,
zero defects, quality circle. **8**

UNIT –V
ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details. **7**

Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

NOE-073: OPERATIONS RESEARCH

L T P
3 1 0

UNIT-I

Introduction:
Difinition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:
Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Teachniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V Inventory

Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.

Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.

Cell Division: Mitosis and Meiosis. **8**

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.

Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication. **7**

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.

Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics. **9**

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention. **9**

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies. **7**

Text Books/ Reference Books:

1. Smith, “Biotechnology” Cambridge Press.
2. P.K. Gupta, “Elements of Biotechnology” Rastogi
3. H. D. Kumar, “Modern concepts of Biotechnology” Vikas publishing House.

OPEN ELECTIVES- II

NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I

Introduction

Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. **3**

Solar Cells:

Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. **4**

UNIT-II

Solar Thermal Energy:

Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations. **9**

UNIT-III Geothermal Energy:

Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. **4**

Magneto-hydrodynamics (MHD):

Principle of working of MHD Power plant, performance and limitations. **2**

Fuel Cells:

Principle of working of various types of fuel cells and their working, performance and limitations. **3**

UNIT-IV

Thermo-electrical and thermionic Conversions:

Principle of working, performance and limitations. **2**

Wind Energy:

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems. **6**

UNIT-V

Bio-mass:

Availability of bio-mass and its conversion theory. **2**

Ocean Thermal Energy Conversion (OTEC):

Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave:

Principle of working, performance and limitations.
Waste Recycling Plants. **3**

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.

6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

NOE-82: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded
trajectories. **8**

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle. **7**

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and
applications to nonlinear systems. **8**

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension. **8**

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy);.control of chaos. **9**

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE- 083: PRODUCT DEVELOPMENT

L T P
3 1 0

UNIT-1

Concept of Product, definition and scope.

Design definitions, old and new design methods, design by evolution, examples such as evolution of sewing M/C, bicycle, safety razor etc., need based developments, technology based developments physical relaibility & economic feasibility of design concepts.

UNIT –II

Murphology of design, divergent, transformation and convergent phases of product design, identification of need, Analysis of need. Design criteria; functional, aesthetics, ergonomics, form, shape, size, colour.

Mental blocks, Removal blocs, Ideation techniques, Creativity, Check list.

UNIT –III

Transformations, Brainstorming& Synetics, Morephological techniques.

Utility Concept, Utility Valaue, Utility Index, Decision making under Multiple Criteria.

Economic aspects, Fixed and variable costs, Break-even analysis.

UNIT-IV

Reliability considerations, Bath tub curve, Reliability of systems in series and parallel, Failure rate, MTTF and MTBF, Optimum spares from Reliability considerations.

Design of display and controls, Man- machine interface, Compatibility of displays and controls. Ergonomic aspects, Anthroprometric data and its importance in design.

Application of Computers in Product development & design.

UNIT-V

Existing techniques, such as work-study, SQC etc. for improving method & quality of product.

Innovation versus Invention. Technological Forecasting.

Use of Standards for Design.

Text/Reference Books:

3. A.K. Chitab& R.C. Gupta “Product design & Manufacturing” – Prentice Hall (EE)
4. R.P. Crewford, “The Technology of creation Thinking” Prentice Hall.
5. C.D. Cain, “Product Design & Decision” Bussiness Books.
7. C.D. Cain, “Engg. Product Design” Bussiness Books.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control,

and introduction to robot vision.

5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, "Industrial Robots" Mcgraw Hill.
6. Asfahl, "Robots & Manufacturing Automation" Wily Eastern.

DR. A.P.J ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. FOURTH YEAR

(CIVIL ENGINEERING)

On

Choice Based Credit System

(Effective from session 2019-20)

SEVENTH SEMESTER CIVIL ENGINEERING SESSION 2019-20

S. No.	Subject Code	Subject Name	Department	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		Open Elective Course-1	Other Deptt.	3---0---0	70	20	10	100	3
2	RCE071 RCE072 RCE073 RCE074	**Elective -3** Geology and Soil Mechanics Rural Development Engineering Structural Health Monitoring & Rehabilitation River Engineering	Core Deptt.	3---0---0	70	20	10	100	3
3	RCE075 RCE076 RCE077 RCE078	**Elective -4** Computational Fluid Dynamics Railways, Airport & Water Ways Air & Noise Pollution Control Ground Improvement Techniques	Core Deptt.	3---1---0	70	20	10	100	4
4	RCE701	Design of Structure-III	Core Deptt.	3---1---0	70	20	10	100	4
5	RCE702	Water Resources	Core Deptt.	3---0---0	70	20	10	100	3
6	RCE751	Non Destructive Testing Laboratory	Core Deptt.	0---0---2	50		50	100	1
7	RCE752	Mini Project	Core Deptt.	0---0---2	50		50	100	1
8	RCE753	Industrial Training	Core Deptt.	0---0---3			100	100	2
9	RCE754	Project-1	Core Deptt.	0---0---6			200	200	3
	TOTAL				**450**	**100**		**1000**	**24**

Industrial Training: Industrial Training 1 (completed after IVth sem) & 2 (completed after VIth sem) is to be evaluated in VII semester.

Project-1:-Students will initiate Project work in VII semester as Project -1 and the same will be completed in VIII semester as Project-2.

Evaluation of Project-1 should be based on the progress reported by the student and certified by the supervisor.

RCE701 Design of Structure-III **(L-T-P 3-1-0)** **Credit – 4**

NOTE: All design are to be carried as per IS:800-2007

UNIT - I Introduction to steel structures. Advantages and Disadvantages of Steel as a Structural Material. Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements. Introduction to Limit State Design Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design. **[8]**

UNIT - II Introduction to Riveted, Bolted and Pinned Connections, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Design of eccentric bolted connections . Simple Welded Connections, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Design of eccentric welded connections. **[8]**

UNIT – III Introduction to Tension Members, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate. **[8]**

UNIT – IV Introduction to Compression Members, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Splices, Design of Column Bases. **[8]**

UNIT – V Introduction to Beams, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Purlins, Beam Bearing Plates, Effect of Holes in Beam, Introduction to Plate Girder , Introduction to Gantry Girder. **[8]**

Text Books

1. Design of Steel Structures by N. Subramanian, Oxford University Press
2. Limit State Design of Steel Structures by S. K. Duggal, Tata Mcgraw Hill.
3. Design of Steel Structures by K S Sairam, Pearson Education
4. Design of Steel Structures by S Ramamurtham, DhanpatRai Publishing Company.

Reference Books

1. Steel Structures by Robert Englekirk. Hohn Wiley & sons inc.
2. Structural Steel Design by Lambert tall (Ronald Press Comp. Newyork.
3. Design of steel structures by Willam T Segui , CENGAGE Learning
4. Structural Steel Design By D MacLaughlin, CENGAGE Learning

RCE702 Water Resources (L-T-P 3-0-0) Credit - 3

UNIT – I Hydrology: Hydrological Cycle and its components; Water Budget Equation, Precipitation: Types, measurements and analysis, Evaporation and consumptive use: estimation and measurement techniques.
Irrigation: Necessity and types, Advantages & disadvantages of irrigation; Functions of water in plant growth, Methods of Irrigation, Water requirement of crops, Duty and Delta relationship; Irrigation frequency; Irrigation efficiencies; Principal crops and crop season, crop rotation.
Canal irrigation: Classes and alignment, Parts of a canal system, Command area, curves in channels, channel losses.
Introduction to Sediment Transportation: Suspended and Bed load and its estimation **[8]**

UNIT – II Irrigation channels and Design: Types: lined and unlined, silt theories: Kennedy's and Lacey's Design procedure for irrigation channels, longitudinal cross section, Schedule of area statistics and channel dimensions, cross sections of an Irrigation channel,
Lining of Irrigation Canals: Advantages and types; factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining. Water Logging and Drainage Design: effects, causes and anti-water logging measures, Drainage of water logged land. **[8]**

UNIT – III Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects
Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion
River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.
Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh's theory, Khosla's theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification; Introduction to design principle of falls, Design of Sarda type and straight glacis tall.
Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars **[8]**

UNIT – IV Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.
Cross drainage works: Necessity and types; Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. **[8]**

UNIT – V Dams: classification and selection criteria.
Earth Dams: Classification, causes of failure, Phreatic line, and its determination Introduction to stability analysis
Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.
Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.
Hydro-Electric Power: assessment of potential in reference to India, classification of power plants, important terms, types of turbines and their suitability; Power House layout and important structures of a powerhouse. **[8]**

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill
4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers
5. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.

References

1. Fundamental of Hydraulic Engineering System by Houghalen, Pearson Publication.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.
5. Water resource engineering by Ralph A. Wurbs & Wesley P. James, Pearson Publication.

RCE071 Geology and Soil Mechanics **(L-T-P 3-0-0) Credit - 3**

UNIT- I Minerals : Their physical and detailed study of certain rock forming minerals.

Rocks structure of earth and formation of rocks. Texture and classification of rocks. Engineering properties, weathering and suitability of rocks as Engg. materials. **[8]**

UNIT- II Stratification and Lamination bedding of rocks. Dip and strike of bed.

Rock deformation : Folds, Faults, joints unconformity and their classification, causes and relation to engg. behaviour of rock masses. **[8]**

UNIT- III Earthquake, its causes, classification, seismic zones of India and geological consideration for construction of building, projects in seismic areas.

Landslides: Causes, classification and preventive measures. **[8]**

UNIT –IV Geological investigations for site selection of dams, reservoirs tunnels, bridges and highways.

Principles of geophysical explorations methods for subsurface structures. **[8]**

UNIT- V Clay Mineralogy, index properties of soil, IS classification of soil, shear strength of soil, Effective stresses in soil, stress in soil (Boussiensq, Westergaard theories) & Earth pressure theories and their application. **[8]**

REFERENCES:

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, “Soil Mechanics & Foundation Engineering”, John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.
4. Varghese, P.C., Engineering Geology for Civil Engineering Prentice Hall of India Learning Private Limited, New Delhi, 2012.
5. Venkat Reddy. D. Engineering Geology, Vikas Publishing House Pvt. Lt, 2010.
6. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics.
7. J.M. Treteth : Geology of Engineers, Princeton, Von. Nostrand.
8. Prabin Singh : Engg. and General Geology, Katson Publishing House
9. F G Bell : Funamentals of Engineering Geology , B S Publication
10. P.K. Mukerjee : A text Book of Geology, Calcutta Word Publishers.

RCE072 Rural Development Engineering **(L-T-P 3-0-0) Credit - 3**

UNIT- I Rural Development Planning and Concept of Appropriate Technology: Scope; development plans; various approaches to rural development planning; concept of appropriate technology. Rural development programme/ projects. **[8]**

UNIT- II Rural Housing: Low cost construction materials for housing; Architectural considerations for individual and group housing; Composite material - ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls; design consideration and construction of: non-erodable mud plaster, Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry; rat-trap bond for walls; Panels for roof, ferro-cement flooring / roofing units, Earthquake resistant measures for low cost houses. **[8]**

UNIT- III Water Supply and Rural Sanitation: Sources of water. BIS & WHO water standards. Quality, Storage and distribution for rural water supply works; basic design principles of treatment-low cost water treatment technologies; conservation of water; rainwater harvesting; drainage in rural areas, low cost waste disposal systems; septic tank ; Biogas technology; low cost community & individual Garbage disposal systems, Ferro-cement water storage tanks. **[8]**

UNIT- IV Low Cost Roads and Transport: Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases, Bituminous Construction, Surface Treatments for roads in rural areas. Soil Stabilization, Lime, Lime Flyash and Cement Treated Course. Crusher-run-Macadam. Use of local materials. Flexible Pavement: Design factors, Basic Principles, Guidelines for Surfacing for Rural Road. **[8]**

UNIT- V Low Cost Irrigation: Consideration of low cost irrigation techniques , drip & sprinkler irrigation systems. Watershed and catchments area development - problems and features of watershed management, watershed structures **[8]**

Reference Books:

1. A.G.Madhov Rao, D.S.Ramachandra Murthy, Appropriate Technologies for low cost Housing Oxfordand IBH Publishing Co. Pvt .Ltd.
2. CBRI, Roorkee, Advances in Building Mat erials and Construction.
3. C. Satyanarayana Murthy, Design of Minor Irrigation and Canal Structures. Wiley Eastern Ltd.,
4. Document on Rural Road Development in India Volume1& 2; Central Road Research Institute, New Delhi.
5. Water supply and sanitary engineering by Rangwala, .Charotar publication
6. Rural Infrastructure by P.Nair, SBS Publication
7. Rural Infrastructure by Samalia Bihari Verma, Gyaneshwar Prasad & Sahib Kumari Singh, Sarup & Sons.
8. Rural Development by Katar Singh, SAGE Publication

9. Information and Communication Technology for Agriculture and rural development by R. Saravanan, New India Publishing agency

RCE073 Structural Health Monitoring & Rehabilitation (L-T-P 3-0-0) Credit - 3

UNIT - I Maintenance: Repair and rehabilitation, facts of maintenance, importance of maintenance various aspects of inspection, assessment procedure for evaluating damaged structure, causes of deterioration.

Repair Strategies: Causes of distress in concrete structures, construction and design failures, condition assessment and distress-diagnostic techniques, assessment procedure for inspection and evaluating a damaged structure. **[8]**

UNIT - II Serviceability and Durability of Concrete: Quality assurance for concrete construction, concrete properties – strength, permeability, thermal properties and cracking. effects due to climate, temperature, chemicals, corrosion. **[8]**

UNIT - III Materials and Techniques for Repair: Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, fibre reinforced concrete, bacterial concrete, rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, gunite and shotcrete, epoxy injection, mortar repair for cracks, shoring and underpinning. **[8]**

UNIT - IV Repair, Rehabilitation and Retrofitting Techniques: Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

Repair of structure: Common types of repairs, repair in concrete structures, repairs in under water structures.

Strengthening of Structures: Strengthening Methods, retrofitting, jacketing. **[8]**

UNIT – V Health Monitoring and Demolition Techniques: Long term health monitoring techniques, engineered demolition techniques for dilapidated structures, use of sensors for building instrumentation. **[8]**

Suggested Reading:

1. Concrete Technology by A.R. Santakumar, Oxford University press
2. Defects and Deterioration in Buildingts, E F & N Spon, London
3. Non-Destructive Evaluation of Concrete Structures by Bungey - Surrey University
4. Maintenance and Repair of Civil Structures, B.L. Gupta and Amit Gupta, Standard Publications.

5. Concrete Repair and Maintenance Illustrated, RS Means Company Inc W. H. Ranso, (1981)
6. Building Failures : Diagnosis and Avoidance, EF & N Spon, London, B .
7 .Mehta, P.K and Montevic. P.J., Concrete- Microstructure, Properties and Materials, ICI, 1997.,
8. Jackson, N., Civil Engineering Materials, ELBS, 1983.

RCE074 RIVER ENGINEERING (L-T-P 3-0-0) Credit - 3

UNIT– I Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes. **[8]**

UNIT –II Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control. **[8]**

UNIT-III Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. **[8]**

UNIT-IV Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.
[8]

UNIT-V River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works. **[8]**

Text book:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson
4. Principles of River Engineering by (the non tidel alluvial) PH Jameen

RCE075 Computational Fluid Dynamics (L-T-P 3-1-0) Credit - 4

UNIT-I Introduction to Computational Fluid Dynamics, Basic concepts of CFD: Finite difference approximations, Consistency, stability and convergence. **[8]**
UNIT-II Derivation of equations governing fluid flow, Equations for incompressible flow and boundary conditions. **[8]**

UNIT - III Fundamentals of discretization, finite Volume approach and discretization of unsteady-state problems. Classification calculation of flow in a rectangular duct ,Calculation of fully developed flow in a triangular duct. **[8]**

UNIT- IV Solution of Navier Stokes equations for compressible flows and incompressible flows, solution of linear algebraic equations: basic methods and advanced methods. **[8]**

UNIT-V Basics of finite volume method including grid generation, Turbulent flows and turbulence modelling. **[8]**

REFERENCES:

1.Ferziger J.H. & Peric M. (1999) Computational Methods for Fluid Dynamics, Springer, Berlin, Germany.
2.Hirsch C. (1988) Numerical Computation of Internal and External Flows, John Wiley & Sons, New York, USA.
3.Patankar S.V. (1980) Numerical Heat Transfer and Fluid Flow, Hemisphere, Washington D.C., USA.
4.Versteeg H.K. & Malalsekera W. (1995) An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Longman Scientific & Technical, Harlow, Essex, UK.
5.Anderson J.D. (1995) Computational Fluid Dynamics: The Basics with Applications,McGraw-Hill, Inc.
6.John C. Tannehill, Dale A. Anderson and Richard H. Pletcher, Computational Fluid Mechanics and Heat Transfer, Taylor &Francis.
7. T. J. Chung, Computational Fluid Dynamics, Cambridge University Press.

RCE076 Railways, Airport & Water Ways **(L-T-P 3-1-0) Credit - 4**

UNIT –I Introduction to Permanent Way and its Components: History and administrative setup of Indian Railways; Rails, Type of rails, rail gauges, permanent way formation,– functions, requirements, sections in embankment and cutting (single/double track), electrified tracks, locomotives, wheel and axle arrangement, coning of wheels, defect in rails, rail fastenings, Fish plates, spikes, chairs, keys, bearing plates. sleepers, Timber, steel, cast iron, concrete and prestressed concrete sleepers, sleeper density, ballast: material, specifications. **[8]**

UNIT-II Track Geometrics, Turnouts and Crossings, Stations and Yards: Railway alignment, vertical alignment – gradients and grade effects, horizontal alignment – horizontal curves, super-elevation, concepts of cant excess and deficiency, safe permissible speed, transition curves, widening of gauges and track clearances, points and crossings – terminologies, types of turnouts, design of turnouts, types of crossings, design of crossings. Different types of stations and Yards: classification and functioning.

[8]

UNIT –III Signalling and Interlocking, Urban Railways: Classification of Signals, method of train working, absolute block system, Centralized train control system, ATS, interlocking of track, principle of interlocking, types of interlocking, high speed track – track requirement, speed limitations, high speed technologies, Urban railway- railway system in urban areas. **[8]**

UNIT – IV Introduction to Airport Engineering Air craft characteristics affecting airport planning & design, selection of site for an airport. Airports - layout and orientation, Runway and taxiway design consideration and geometric design. Airport drainage management, Zoning laws, Visual aids and air traffic control, Runway lighting, Runway operation Helipads, hangers, service equipment. **[8]**

UNIT – V Water Transport Harbours and ports, Types of Harbours; Harbours - layouts, shipping lanes, anchoring, location identification; Littoral transport with erosion and deposition; sounding methods; Dry and Wet docks, components and operational Tidal data and analyses. Inland waterways: advantages and disadvantages; Development in India. Inland water operation. **[8]**

Text Books

1. A Text Book of Railway Engineering by S. P. Arora & S. C. Saxena
2. Railway Engineering by M. M. Aggrawal.

References

1. Railway Engineering by Rangwala (Charotar Publishing House).
2. Airport Engineering by Rangwala (Charotar Publishing House).
3. Airport Planning & Design by Khanna , Arora & Jain Nem Chand & Brothers).
4. Docs & Harbour Engineering by Bindra (Dhanpat Rai Publishing Company).
5. Docs & Harbour Engineering by Rangwala (Charotar Publishing House).
6. Docs & Harbour Engineering by Oza (Charotar Publishing House).

RCE077 Air & Noise Pollution Control

(L-T-P 3-1-0) Credit - 4

UNIT- I Air pollution: composition and structure of atmosphere, global implications of air pollution. classification of air pollutants: particulates, hydrocarbon, carbon monoxide, oxides of sulphur, oxides of nitrogen and photochemical oxidants. Indoor air pollution. Effects of air pollutants on humans, animals, property and plants. **[8]**

UNIT - II Air pollution chemistry, meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion. **[8]**

UNIT - III Ambient air quality and standards, air sampling and measurements. Control of particulate air pollutants using gravitational settling chambers, cyclone separators, wet collectors, fabric filters (Bag-house filter), electrostatic precipitators (ESP). **[8]**

UNIT - IV Control of gaseous contaminants: Absorption, Adsorption, Condensation and Combustion, Control of sulphur oxides, nitrogen oxides, carbon monoxide, and hydrocarbons. Automotive emission control, catalytic convertor, Euro-I, Euro-II and Euro-III specifications, Indian specifications. **[8]**

UNIT - V Noise pollution: Basics of acoustics and specification of sound; sound power, sound intensity and sound pressure levels; plane, point and line sources, multiple sources; outdoor and indoor noise propagation; psychoacoustics and noise criteria, effects of noise on health, annoyance rating schemes; special noise environments: Infrasound, ultrasound, impulsive sound and sonic boom; noise standards and limit values; noise instrumentation and monitoring procedure. Noise indices. Noise control methods. **[8]**

References:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering.
2. Martin Crawford: Air Pollution Control Theory.
3. Wark and Warner: Air Pollution: Its Origin and Control.
4. Rao and Rao: Air Pollution Control Engineering.
5. Nevers: Air Pollution Control Engineering.
6. Mycock, McKenna and Theodore: Handbook of Air Pollution Control Engineering and Technology.
Suess and Craxford: W.H.O. Manual on Urban Air Quality Management
7. C.S. Rao, Air pollution and control
8. Advanced Air and Noise Pollution Control by Lawrence K. Wang, Norman C. Pereira & Yung Ise Hung.
9. Noise Pollution and Control by S. P.Singhal , Narosa Pub House
10. Textbook of Noise Pollution and Its Control by S. C. Bhatia, Atlantic; Edition

RCE078 Ground Improvement Techniques **(L-T-P 3-1-0) Credit - 4**

UNIT -I Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes. **[8]**

UNIT -II In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement. **[8]**

UNIT -III In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method. **[8]**

UNIT – IV Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test. **[8]**

UNIT -V Underpining of foundations: importance and situations for underpinning, methodology, typical examples. Geotextiles: types, functions, specifications, precautions in transportation and storage. **[8]**

Recommended:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics
7. Ground Improvement Techniques by Dr. P Purushothama Raj

RCE751 Non Destructive Testing Laboratory (L-T-P 0-0-2) Credit - 1

NOTE: Student will have to perform minimum 3 test on concrete & two test on structural steel

1. Non Destructive Testing of reinforced cement concrete
   - (a) Strength assessment using rebound hammer
   - (b) Quality assessment using ultrasonic puls velocity test
   - (c) Strength assessment using pull out method
   - (d) Assessment of corrosion of reinforcing bars using half cell potentiometer
   - (e) To determine thickness of concrete cover, diameter & spacing of reinforcing bars using rebar scanner.
2. Testing of structural steel
   - (a) Testing for corrosion of structural steel
   - (b) Assessment of thickness of pipes/tubes/structural steel
   - (c) Test for welding performance with Di-penetration test, ultrasonic test & magnetic particle test

RCE752 Mini Project **(L-T-P 0-0-2) Credit - 1**

- **Students will be asked to work upon minimum four of the following topics during the semester.**
- **They will submit the report of each topic containing following information (as per need of topic) like: introduction, general information, usage/application (if any) detailed description of work/process, relevant diagrams, drawings & tabulation (if any), observation and results (as applicable) or any other relevant information as per topic.**

1. Work related to preparation of bill of quantity & tender document.
2. Work related to design & drawing of flat slab using IS code method.
3. Work related to cost estimation of (including market survey of rates by students) building/earth work for a highway.
4. Work related to scheduling of activities of a project using relevant software
5. Work related to preparation of layout plan of a building and its marking on ground.
6. Design & analysis of a G+5 residential building using structural design and analysis software like STAAD Pro/STRUDS/SAP/ETAB/STRAP.
7. Work related to design of a small sewage treatment plant (STP) unit for a residential society.
8. Work related to computation of surface runoff & design of rain water harvesting system for given area (relevant software may be used for runoff computation).

EIGHTH SEMESTER **CIVIL ENGINEERING** **SESSION 2019-20**

S No.	Subject Code	Subject Name	Teaching Deptt.	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		Open Elective Course -2	Other Deptt.	3---0---0	70	20	10	100	3
2	RCE081 RCE082 RCE083 RCE084	**Elective -5** Finite Element Method Structural Dynamics Advanced Concrete Design Solid Waste Management	Core Deptt.	3---1---0	70	20	10	100	4
3	RCE085 RCE086 RCE087 RCE088	**Elective -6** Engineering Hydrology and Ground Water Management Urban Transportation System & Planning Probability Methods in Civil Engineering Earthquake Resistant Design of Structure	Core Deptt.	3---0---0	70	20	10	100	3
4	RCE851	Seminar	Core Deptt.	0 ---0---3			100	100	2
5	RCE852	Project-2	Core Deptt.	0---0---12	350		250	600	12
	TOTAL				**560**	**60**	**380**	**1000**	**24**

The required identification and distribution of electives through NPTEL has been made as given below.

Sem	Departmental Elective	Name of Elective through NPTEL
VIII	5	RCE082 Structural Dynamics
	6	RCE087 Probability Methods in Civil Engineering

RCE081 Finite Element Methods **(L-T-P 3-1-0) Credit – 4**

UNIT - I Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. **[8]**

UNIT - II FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equationsnby Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrila1teral elements. **[8]**

UNIT - III Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super - parametric elements, Concept of Jacobin matrix. Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, **[8]**

UNIT - IV Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermition shape functions. Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Langrage's formula, Plane stress problems. **[8]**

UNIT - V Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method. Analysis of frames and different problems, Different axi-symmetric truss problems. **[8]**

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval , PHI
3. Finite Elements in Engineering:- Chandrupatta, et. AI. Prentice Hall of India Pvt. Ltd.,
4. Finite element method with application in engineering by Chandrupatla & Belegundu, Pearson Publication. 5. Finite Element Method Basics concept & Applications by Alawala
6. Fundamental of Finite element Analysis by Devid V. hutton
7. Finite element Methods is fundamentals an application in engineering by Chen Z

Reference:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wilely & sons 3rd Edn. New York, 2000

2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New Delhi.

RCE082 Structural Dynamics **(L-T-P 3-1-0) Credit - 4**

UNIT- I Introduction of Structural Dynamics, differential equations in civil engineering, types of analysis/static and dynamic load, degree of freedom ,generation of stiffness matrix), dynamic equilibrium equation, solution of equilibrium equation, Undamped free vibration solution, natural period/frequency ,energy in free vibration, damped free vibration, types of damping, logarithmic decrement equation. **[8]**

UNIT - II Undamped forced vibration , amplitude & phase angle , dynamic amplification factor for deflection(R_{d}), damped forced vibration, relationship between R_d, R_v, & R_a , Resonant frequency and half power band width, force transmission and Isolation, Introduction of vibration measuring Instruments. **[8]**

UNIT – III Response to Unit Impulse , response to arbitrary force (duhamel's Integral), response to step and ramp forces, response to rectangular pulse, half sinusoidal wave, time stepping methods, central difference method, Newmark's Method , Concept of response spectrum, uses of response spectrum, response of structure in frequency domain. **[8]**

UNIT – IV Equation of Motion for MDOF System , Solution of equation, natural frequencies and mode shapes, modal orthogonality, approximate method for finding natural frequency , Time History Analyis, Response spectrum Analysis, 3 D dynamic Analysis , Vibration of continuous systems, shear behavior and bending behavior, generalized SDOF. **[8]**

UNIT – V Dynamics of rigid blocks, Non structural elements, floor response spectrum, Introduction to vibration control, active control, passive control, design of tuned mass damper by displacement and energy perspectives. **[8]**

References Books:

1. “Dynamics of structures” by Anil K Chopra, Pearson Education Limited.
2. “Structural Dynamics” by Clough & Penzin, McGraw-Hill Education .
3. “Theory of Vibrations” by Thompson, Pearson Education Limited.

4. “Elements of vibration analysis” by Leonard Mirovitch , McGraw-Hill Education .
5. “Structural dynamics” by Madhujit Mukhopadyay ,Ane Books India.

RCE083 Advanced Concrete Design (L-T-P 3-1-0) Credit - 4

UNIT - I Introduction to liquid retaining structures, design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground and underground. **[8]**

UNIT - II Design of over-head tanks: design of RC domes and beams curved in plan, design of cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. **[8]**

UNIT - III Introduction to prestressing, assumptions, general principles ,advantages of prestressing, Axially placed tendons, bent tendons, parabolic tendons, load balancing concept, pressure line , systems of prestressing, pretensioning and post tensioning, Hoyer system, Freyssinet system ,Le-Mccall system, Magnel-Blaton system, Gifford-Udall system, C.C.L standard system. **[8]**

UNIT - IV Losses in prestress, IS 1343 recommendations for prestressed concrete, stages of loading to be considered in design, handling and transportation of precast prestressed concrete beams , analysis and design of simple prestressed beams, Lever arm conception, kern distance. **[8]**

UNIT - V Introduction to deep beams, minimum thickness, design of deep beams by IS 456, check for local failures, detailing of deep beams, Introduction to Corbels, Shear friction, Corbel dimensions, design of a corbel. **[8]**

Text Books & References

1)IS : 456 – 2000, “ Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2)IS 3370-2009, “Indian Standard concrete structures for storage of liquids - code of practice”, Bureau of Indian Standards, New Delhi
3)IS 1343-2012, “Indian Standard prestresed concrete - code of practice”, Bureau of Indian Standards, New Delhi
4)Shah. H.J.., “Reinforced Concrete Vol : 2”, Charotar publishing house pvt. Ltd.
5)Varghese P.C. “ Advanced Reinforced concrete design”, PHI learning pvt. Ltd.
6)Ramamrutham S. and Narayan R. ,”Design of Reinforced Concrete Structures”, Dhanpat Rai Publishing company pvt. Ltd.
7)Jain, A.K., “Reinforced Concrete: Limit State Design”, Nem Chand & Bros., Roorkee.
8)Punmia B.C. ,Jain A.K.,” Limit State Design of Reinforced Concrete”, Laxmi Publications pvt. Ltd.

RCE 084 Solid Waste Management (L-T-P 3-1-0) Credit - 4

UNIT-I Solid waste: Public health and ecological impacts, Sources and types of solid wastes, material flow and waste generation, Functional elements: Waste generation, storage, collection, Transfer and transport, processing and recovery, disposal. Physical and chemical composition of municipal solid waste, integrated solid waste management, hierarchy of waste management options, different methods for generation rates. Storage: movable bins, fixed bins. Collection: home to home collection, community bin system. Theory and design of hauled container system, stationary container system. **[8]**

UNIT-II Transportation: handcart, tri-cycle, animal cart, tripper truck, dumper placer, bulk refuse carrier, railroad transport, water transport, conveyors, layout of routes. Engineering system for on-site handling and processing of solid waste: separators, size reduction equipments, screening equipments, densification, baling, cubing, pelleting equipments. **[8]**

UNIY-III Landfilling: Site selection criteria, landfill layout, landfill sections, Occurrence of gases and leachate in landfills: composition and characteristics, generation factors, initial adjustment phase, transition phase, acid formation phase, methane formation phase, maturation phase of gases and leachate, Introduction to engineered landfills. **[8]**

UNIT-IV Composting, types of composting, process description, design and operational consideration of aerobic composting, process description, design and operational consideration of anaerobic composting. Thermal conversion technologies: incineration and pyrolysis system, energy recovery, system. Overview of solid waste management practices in India. **[8]**

UNIT-V Introduction to Hazardous wastes, Definition of Hazardous waste, The magnitude of the problem; Hazardous waste: Risk assessment, Environmental legislation, Characterization and site assessment, Waste minimization and resource recovery, Transportation of hazardous waste, Disposal of hazardous waste.
Introduction to Electronic waste and Biomedical waste and their disposal. **[8]**

References:

1. Tchobanoglous, G., Theisen, H., & Vigil, S.A; Integrated Solid Waste Management: McGraw Hill, New York
2. Solid Waste Engineering, Principle & Management issues by Ven Te Chow
3. Bhide, A.D., B.B. Sundaresan, Solid Waste Management in developing countries.
4. Manual on Municipal solid Waste Management, CPHEEO, Govt. of India.
5. Guidelines for Management and Handling of Hazardous wastes MOEF (1991), Govt. of India.
6. Datta, M; Waste Disposal in Engineered Land fills, Narosa Publishers, Delhi.
7. Waste Management "Asian and Pacific Center for Transfer of Technology (N.D.) India", September 1993.

8. Solid and Hazardous Waste Management: Science and Engineering by M.N. Rao, Razia Sultana & Sri Harsha Kota
9. E-Waste Management: From Waste to Resource by Ramzy Kahhat, Klaus Hieronymi, Eric Williams.
10. Biomedical Waste Management by R. Radhakrishan
11. Electronic Waste Management (Issues in Environmental Science and Technology) by R. E. Hester , R. M. Harrison & Martin T. Goosey

RCE085 Engineering Hydrology & Groundwater Management

(L-T-P 3-0-0) Credit - 3

UNIT – I Introduction: hydrologic cycle, water budget equations, world water balance, Precipitation: Forms of precipitation, measurement. Introduction to characteristics of storm. Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapotranspiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities indices, measurement & estimation. **[8]**

UNIT – II Runoff and Hydrographs: Runoff characteristics of stream, mass curve. Hydrograph, Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs. **[8]**

UNIT – III Flood: Rational method, empirical formulae, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing. **[8]**

UNIT – IV Groundwater: Introduction, forms of subsurface water, aquifers & its properties, Occurrence of ground water, hydro-geology & aquifers, Ground water movement.
Steady and unsteady flow through confined and unconfined aquifers. Well Hydraulics: Single& Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity. **[8]**

UNIT – V Water Wells: Introduction to Well construction, completion and Development. Pumping equipment for water wells, maintenance of wells.
Ground Water quality, Contamination of groundwater and its Control, Ground Water Modelling Techniques and exploration, Artificial discharge and Recharge of Ground Water, Roof-top rainwater harvesting and recharge. **[8]**

<u>Text Books:</u>

• 'Groundwater Hydrology' by Todd D. K., Wiley
• 'Groundwater Resource Evaluation' by Walton W. C. , McGraw Hill
• 'Groundwater' by Raghunath H. M., New Age Publisher
• 'Engineering Hydrology' by K. Subramanya, Mc Graw Hill Education
• 'Hydrology: Principles. Analysis. Design' by Raghunath H. M., New Age Publisher
• 'Handbook of Applied Hydrology' by Chow V. T. , Mc Graw Hill Education

Reference:

• 'Irrigation: Theory & Practice' by Michael A. M., Vikas Publication House
• 'Groundwater' by S.Ramakrishnan, Scitech Publications
• 'Irrigation: Theory & Practice' by Michael A. M., Vikas Publication House
• 'Engineering Hydrology' by Ojha, Oxford University Press.
• 'Introduction to Hydrology' by Viessman & Lewis by Pearson Publication.
• 'Applied Hydrology' by Fetter, by Pearson Publication

RCE086 Urban Transportation System & Planning (L-T-P 3-0-0) Credit - 3

UNIT-I Introduction to transportation planning, the planning concept, Goals, objective and Importance of transportation planning. Nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the Cities, Freight Transportation, Future Developments. **[8]**

UNIT- II Urban form and Transport patterns, land use – transport cycle, concept of accessibility. Types of transport systems, evolution of transport modes, transport problems and mobility issues. Public Transport: Intermediate Public Transport (IPT) Rapid and mass transport system like MRTS & bus rapid transit. Transport Planning Process, Problem Definition, Solution Generation. **[8]**

UNIT- III Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment. **[8]**

UNIT- IV Studying travel behavior. Analyzing urban travel markets. Traffic and transportation surveys and studies, traffic and travel characteristics, urban transport planning process – stages, study area, zoning, database, **[8]**

UNIT-V Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method. Transport system management: Long term and short term planning. **[8]**

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. “Highway Engineering”, Nem Chand and Bros., Roorkee- 247 667.
2. Kadiyali L. R., & Lal, N.B. “Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)”, Khanna Publications, Delhi – 110 006

References:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning- E.K.Mortak.
3. Metropolitan Transportation planning-J.W.Dickey.
4. Traffic Engineering, L.R. Kadiyali
5. Hutchinson,B.G.(1974).Principles of Urban Transport Systems Planning. Mc Graw Hill Book Company, New York.
6. John W.Dickey.(1975). Metropolitan Transportation Planning. Mc Graw Hill Book Company, New York.

RCE087 Probability Methods in Civil Engineering (L-T-P 3-0-0) Credit - 3

UNIT -I Introduction: Role of Probability in Civil Engineering Problems, Random Events: Definition of basic random events; Application of set theory in definition of composite event operations; Probability of events and definition of probability axioms; Solution of real life examples from civil engineering. **[8]**

UNIT- II Random Variables: Definition of random variables – discrete and continuous; Probability definitions – PMF, PDF, CDF; Moments and expectations.
Functions of Random Variables: Definition of probability distributions of functions of single random variables – exact methods and approximate methods; Moments and expectations of functions – direct and indirect methods. **[8]**

UNIT- III Multiple Random Variables: Definition of joint, marginal, and conditional probability distributions; Definitions of moments and expectations, including the definition of correlation coefficient; Functions of multiple random variables. **[8]**

UNIT -IV Common Probability Models: Discrete random variables – binomial distribution, Poisson’s distribution; Continuous random variables – exponential distribution, gamma distribution; Central limit theorem; Normal and lognormal distributions **[8]**

UNIT -V Statistics and sampling: Goodness of fit tests; regression and correlation analyses; estimation of distribution parameters from statistics; hypothesis testing and significance; Bayesian updating of distributions. **[8]**

References:

1. Papoulis, A, and S. U. Pillai (2002), Probability, Random Variables and Stochastic Processes, McGraw-Hill, New York.
2. Richard A. Jonson and C. B. Gupta (2005), Miller and Freund's Probability and Statistics for Engineers, Pearson Education, Inc., United States.
3. West M. and J. Harrison (1997), Bayesian Forecasting and Dynamic Models, Springer-Verlag, New York.
4. Ang, A. H-S., and Tang, W., H. "Probability concepts in engineering: Emphasis on applications in civil and environmental engineering." Wiley.
5. Kottegoda, N. T., and Rosso, R. "Applied Statistics for Civil and Environmental Engineers." Wiley.
6.Ross, S. "A first course on probability." Prentice Hall.

RCE088 Earthquake Resistant Design of Structure (L-T-P 3-0-0) Credit – 3

UNIT-I Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes, **[8]**

UNIT-II Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system, **[8]**

UNIT-III Dynamics of multi degree of freedom system, Idealization of structures, seismic response, **[8]**

UNIT-IV Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Introduction to earthquake resistant brick and masonry buildings. **[8]**

UNIT-V Reinforced Concrete framed buildings, Code provisions. Introduction to machine foundation & its design. Degrees of freedom of a block foundation. **[8]**

References:

1. Introduction to Structural Dynamics - J.M. Biggs
2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

Syllabus Applicable

in

Gautam Buddh Technical University
Lucknow

is adopted by the Executive Council of

Mahamaya Technical University
Noida

vide resolution no.13, dated 24 Feb, 2011

for batches admitted in session: 2010-11

B.TECH.

1. Electronics Engineering
2. Electronics & Communication Engineering
3. Electronics & Telecommunication Engineering

4th Year

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA

Study and Evaluation Scheme B. Tech. In Electronics Engg / Electronics & Communication Engg / Electronics & Telecomm Engg

[Effective from the session: 2013-14]

YEAR 4th ,SEMESTER-VI I

S.No.	Subject Code	Subject Name	Periods			Evaluation Scheme				Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	TOT			
THEORY SUBJECTS											
1.	EOE 07*	Open Elective – I**	3	1	0	30	20	50	100	150	4
2.	EOE 02*	Departmental Elective – II	3	1	0	30	20	50	100	150	4
3.	EEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	EEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	EEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	EEC 751	Microwave & Fiber Optics Lab.	0	0	2	-	20	20	30	50	1
8.	EEC 752	Electronics Circuit Design Lab.	0	0	3	-	20	20	30	50	2
9.	EEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10	EEC 754	Project	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	-
Total			15	5	9	150	240	440	560	1000	25

** Open Elective-I

EOE-071	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operation Research
EOE-074	Introduction to Biotechnology
EOE-075/EIC-034	Micro and Smart Systems

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA
Study and Evaluation Scheme B. Tech. in Electronics Engg/ Electronics & Communication Engg/ Electronics & Telecomm Engg
[Effective from the session 2013-14]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	EEC 802	Electronics Switching	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	EEC 851	Project	0	0	12	-	100	100	250	350	8
7.	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

EOE-081 Non Conventional Energy Resources
EOE-082 Nonlinear Dynamic system
EOE-083 Product Development
EOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – I

1. EEC 011 Analog Signal Processing
2. EEC 012 Data Structure
3. EEC 013 Advance Semiconductor Devices
4. EEC 014 Microcontrollers

Elective – II

1. EEC 021 Satellite Communication
2. EEC 022 Digital Image Processing
3. EEC 023 ANN
4. EEC 024 Filter Design

Elective – III

1. EEC 031 Optical Networks
2. EEC 032 Digital System Design using VHDL
3. EEC 033 Speech Processing
4. EEC 034 Integrated Circuit Technology
5. EEC 035 Introduction to RADAR systems

SYLLABUS

EEC 701 OPTICAL COMMUNICATION		3 1 0
UNIT	TOPICS	LECTURES
I	Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques	8
II	Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.	8
III	Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD	8
IV	Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers	8
V	Link Design: Point to Point Links, Power Penalities, Error control,Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter	8

TEXT BOOKS:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

REFERENCE BOOKS

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

EEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	**Topic**	**Lectures**
I	Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.	8
II	Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch ,Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol	8
III	Multiple Access : RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16	8
IV	Network Layer : Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram	8
V	Transport Layer Protocol : UDP and TCP, ATM ATM, Cryptography, Network Security	8

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007

Reference Books:

1. A. S. Tanenbaum, "Computer Networks", PHI.
2. W. Stallings, "Data and Computer Communication", PHI.

EEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances	8
II	MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.	8
III	Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
3. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES II

EEC 021 SATELLITE COMMUNICATIONS		3 1 0
Unit	**Topic**	**Lectures**
I	Elements of Satellite Communication. Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.	8
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	8
III	Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary,	8
IV	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation	8
V	Global Mobile Satellite Systems, Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.	8

Text/ Reference Books:

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4^{th} Ed.
3. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
4. R. Pandya, “Mobile and Personal Communication Systems and Services ”, PHI.

EEC 022 DIGITAL IMAGE PROCESSING		3 1 0
Unit	**Topic**	**Lectures**
I & II	Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model. Image Transforms: One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms. Image Enhancement: Introduction, point operations, histogram modelling, spatial operations, Transform operations.	8
III	Image Restoration: Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.	8
IV	Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding	8
V	Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.	8

Text Books:

1. Rafael C. Gonzalez Richard E Woods, "Digital Image Processing", Pearson, 3rd Ed. 2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI.

EEC 023 Artificial Neural Networks		3 1 0
Unit	Topic	Lectures
I	Introduction: Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.	4 4
II	Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.	2 3
III	Perceptrons and LMS Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α – LMS learning, MSE error surface, steepest descent search, μ – LMS and application. Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning	5
IV	Statistical Pattern Recognition Bayes' theorem, classical decisions with Bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. Stochastic Machines Statistical mechanics, simulated annealing, Boltzmann machine.	4 2 2
V	Adaptive Resonance Theory Building blocks of adaptive resonance, Adaptive Resonance Theory 1. Self Organizing Feature MAP Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, Mexican hat networks.	8

Text Books:

1. Kumar Satish, "Neural Networks", TMH
2. Simon Haykin, "Neural Networks", PHI
3. J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Ed.

EEC 024 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.	8
II	Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.	8
III	Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.	10
IV	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.	8
V	Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.	6

Text Book:

[1] Gobind Daryanani, “Principles of active network synthesis and design”,John Wiley & Sons.

[2] R. Schaumann, M. E. Van Valkenburg, “Design of analog filters”, Oxford University Press.

EEC 751 Microwave and Optical Communication Lab

Minimum Ten Experiments to be conducted:

Part – A (Any 6 Experiments):

1. Study of Reflex Klystron Characteristics.
2 Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench
4. Determine the S-parameter of any Three port Tee.
5 Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8 Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
9 To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

EEC 752 Electronic Circuit Design

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make a hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

EEC 801 Mobile and Wireless Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Parameters of Mobile Multipath Channels types of small scale fading.	8
II	Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.	8
III	Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	8
IV	GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel	8
V	Introduction to Mobile Adhoc Networks, Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal ,"Wireless Communications ",McGraw Hill Publications.
3. R. Pandya, " Mobile and personal communication system", PHI.

Reference Books:

1. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
2. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.
3. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

EEC 802 ELECTRONIC SWITCHING			3 1 0
Unit	Topic	Text Book/ Chapter	Lectures
I	Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.	2/3	8
II	Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.	3/5	8
III	Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.	1/8	8
IV	Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.	2/7 2/8	8
V	Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.	3/10	8

Text Books:

1. Thiagarajan Viswanathan, “Telecommunication switching System and networks”, PHI.
2. J.E. Flood, “Telecommunication switching, Traffic and Networks”, Pearson education.
3. J.C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

ELECTIVE III

EEC 031 OPTICAL NETWORKS		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in non linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters,	8
II	Optical Amplifiers ,Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing,Spectral efficiency,Crosstalk,Introduction of Soliton systems.	8
III	SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network	

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

EEC 032 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

TEXT BOOKS:
1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
REFERENCE BOOKS:
3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

EEC 033 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	10
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	10
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

EEC 034 INTEGRATED CIRCUIT TECHNOLOGY		3 1 0
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon , Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources , Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: :Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Book:

1. S. M. Sze, “VLSI Technology”, 2nd Edition, McGraw –Hill Publication.

Reference Books:

1. S.K. Ghandhi, “VLSI Fabrication Principles”, 2nd Edition,. Willy-India Pvt. Ltd.
2. J. D. Plummer, M. D. Deal and Peter B. Griffin, “Silicon VLSI Technology: Fundamentals, practice and modelling”, Pearson Education.
3. Stephen A. Campbell, “Fabrication Engineering at the micro and nano scale”, Oxford Univ Press.

EEC 035 INTRODUCTION TO RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross-Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, Problems	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low-Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)	8
IV	Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers.	8
V	Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter	8

Text/ Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems" Third Edition.
2. J.C. Toomay , Paul J. Hannen " Principles of Radar" Third Edition.

EIC-034/EOE-075 MICRO AND SMART SYSTEMS		3 1 0
UNIT	TOPICS	LECTURES
I	Introduction, Why miniaturization?, Microsystems versus MEMS, Why micro fabrication?, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems,.	5
II	Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic microrelay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems.	8
III	Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.	8
IV	Modeling of solids in Microsystems: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses. Modelling of coupled electromechanical systems: electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electro-mechanics.	8
V	Integration of micro and smart systems: integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.	

Text book:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, “Micro and smart systems”, Wiley India, 2010.

G. B. Technical University, Lucknow

SYLLABUS

B.Tech THIRD and FOURTH YEAR

(Semester V, VI, VII and VIII)

Computer Science & Engineering
and
Information Technology

Effective from session 2010-11

B.Tech

Study and Evaluation Scheme
Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	ECS-503	Object Oriented Techniques	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	ECS-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	ECS-553	Object Oriented Techniques Lab*	0-0-2	-	25	25	25	50
10	ECS-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

***** *At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2010-11

Computer Science & Engineering
Year-III, Semester VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	ECS-602	Software Engineering	3-1-0	30	20	50	100	150
4	ECS-603	Compiler Design	3-1-0	30	20	50	100	150
5	ECS-604	Web Technology	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	ECS-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	ECS-652	Web Technology based Software Engineering Lab*	0-0-2	-	25	25	25	50
9	ECS-653	Compiler Lab*	0-0-2	-	25	25	25	50
10	ECS-654	Seminar	0-0-2	-	50	50	-	50
11	GP-601	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3	ECS-702	Digital Image Processing	3-1-0	30	20	50	100	150
4		CS-Elective-I	3-1-0	30	20	50	100	150
5		CS-Elective-II	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	ECS-751	Distributed Systems Lab*	0-0-2	-	25	25	25	50
7	ECS-752	Digital Image Processing Lab*	0-0-2	-	25	25	25	50
8	ECS-753	Project	0-0-4	-	50	50	-	50
9	ECS-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Computer Science & Engineering
Year-IV, Semester VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
3		CS-Elective-III	3-1-0	30	20	50	100	150
4		CS-Elective-IV	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	ECS-851	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
6	ECS-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Computer Science & Engineering)

CS-Elective-I

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition

CS-Elective-II

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT-074	IT in Forensic Science

CS-Elective-III

ECS-081	Real Time System
ECS-082	Software Project Management
ECS-083	Embedded Systems
ECS-084	Cryptography & Network Security

CS-Elective-IV

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

* ***Note:* *ECS- 088*** *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

B.Tech

Study and Evaluation Scheme
Effective from session 2010-11

Information Technology
Year-III, Semester-V

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-501	Engineering & Managerial Economics	3-1-0	30	20	50	100	150
2	ECS-501	Operating System	3-1-0	30	20	50	100	150
3	ECS-502	Design and Analysis of Algorithms	3-1-0	30	20	50	100	150
4	EIT-501	E-Commerce	3-1-0	30	20	50	100	150
5	ECS-504	Computer Graphics	2-1-0	15	10	25	50	75
6	EIT-505	Information Security and Cyber Laws	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-551	Operating System Lab*	0-0-2	-	25	25	25	50
8	EIT-552	Algorithms Lab*	0-0-2	-	25	25	25	50
9	EIT-553	Mini Project using Web Technology -1	0-0-2	-	25	25	25	50
10	EIT-554	Computer Graphics Lab*	0-0-2	-	25	25	25	50
11	GP-501	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2010-11

Information Technology

Year-III, Semester-VI

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EHU-601	Industrial Management	3-1-0	30	20	50	100	150
2	ECS-601	Computer Network	3-1-0	30	20	50	100	150
3	EIT-601	Software Project Management	3-1-0	30	20	50	100	150
4		IT-Elective-I	3-1-0	30	20	50	100	150
5	EIT-602	ERP	2-1-0	15	10	25	50	75
6	ECS-505	Graph Theory	2-1-0	15	10	25	50	75
Practicals / Training /Projects								
7	EIT-651	Computer Network Lab*	0-0-2	-	25	25	25	50
8	EIT-652	Software Project Management Lab *	0-0-2	-	25	25	25	50
9	EIT-653	Mini Project using Web Technology -2	0-0-2	-	25	25	25	50
10	EIT-654	Seminar	0-0-2	-	50	50		50
11	GP-601	General Proficiency	-	-	-	-	-	50

Note: *EIT-553 (Mini Project using web technology-1) started in 5th semester has to be continued and completed in 6th semester as EIT-653 (Mini Project using web technology-2)*

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme
Effective from session 2011-12

Information Technology
Year-IV, Semester-VII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-071-EOE-074	Open Elective-I	3-1-0	30	20	50	100	150
2	EIT-701	Cryptography & Network Security	3-1-0	30	20	50	100	150
3	ECS-801	Artificial Intelligence	3-1-0	30	20	50	100	150
4		IT-Elective-II	3-1-0	30	20	50	100	150
5		IT-Elective-III	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
6	EIT-751	Cryptography & Network Security Lab*	0-0-2	-	25	25	25	50
7	EIT-752	Artificial Intelligence Lab*	0-0-2	-	25	25	25	50
8	EIT-753	Project	0-0-4	-	50	50	-	50
9	EIT-754	Industrial Training Viva-Voce	0-0-2	-	50	50	-	50
10	GP-701	General Proficiency	-	-	-	-	-	50

** At least 10 problems are to be considered based on corresponding theory course.*

B.Tech

Study and Evaluation Scheme

Effective from session 2011-12

Information Technology
Year- IV, Semester-VIII

SNo	Subject Code	Subject	Period	Evaluation Scheme				Total
				Sessional			Exam	
				CT	TA	Total		
1	EOE-081-EOE-084	Open Elective-II	3-1-0	30	20	50	100	150
2	ECS-701	Distributed Systems	3-1-0	30	20	50	100	150
3		IT-Elective-IV	3-1-0	30	20	50	100	150
4		IT-Elective-V	3-1-0	30	20	50	100	150
Practicals / Training /Projects								
5	EIT-851	Distributed Systems Lab*	0-0-2	-	25	25	25	50
6	EIT-852	Project	0-0-12	-	100	100	200	300
7	GP-801	General Proficiency	-	-	-	-	-	50

Note:

1. *Practical Training done after 6th Semester would be evaluated in 7th semester through Report and Viva-voce.*
2. *Project has to be initiated in 7th semester beginning and completed by the end of 8th semester with proper report and demonstration.*

** At least 10 problems are to be considered based on corresponding theory course.*

List of Electives for B.Tech (Information Technology)

IT-Elective-I

EIT-061	Software Quality Engineering
EIT-062	Software Testing
EIT-063	Software Reliability

IT-Elective-II

ECS-071	Computational Geometry
ECS-072	Computational Complexity
ECS-073	Parallel Algorithms
ECS-074	Pattern Recognition
EIT-071	Discrete Structures
EIT-072	Theory of Automata and Formal Languages

IT-Elective-III

ECS-075	Data Mining & Data Warehousing
ECS-076	Distributed Database
EIT-073	Bioinformatics
ECS-077	Data Compression
EIT -074	IT in Forensic Science

IT-Elective-IV

ECS-081	Real Time System
ECS-083	Embedded Systems
EIT-081	Digital Image Processing
EIT-082	Multimedia Systems

IT-Elective-V

ECS-085	Neural Networks
ECS-086	Natural Language Processing
ECS-087	Mobile Computing
*ECS-088	Soft Computing

[*]***Note:* *ECS- 088*** *may be opted by only those students who didn't opt* ***EOE-041*** *as an open elective*

SYLLABUS
(Computer Science & Engineering and Information Technology)

ECS-501: Operating System

Unit – I
Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.

Unit – II
Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.

Unit – III
CPU Scheduling: Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock: System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.

Unit – IV
Memory Management: Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.

Unit – V
I/O Management and Disk Scheduling: I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System: File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.

References:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhere, "Operating Systems : A Concept based Approach", 2nd Edition,

TMH
5. William Stallings, “Operating Systems: Internals and Design Principles ”, 6th Edition, Pearson Education

ECS-502: Design and Analysis of Algorithms

Unit-I
Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

Unit -II
Advanced Data Structures*:* Red-Black trees, B – trees, Binomial Heaps, Fibonacci Heaps.

Unit - III
Divide and Conquer with examples such as Sorting, Matrix Multiplication, Convex hull and Searching.
Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning trees – Prim’s and Kruskal’s algorithms, Single source shortest paths - Dijkstra’s and Bellman Ford algorithms.

Unit - IV
Dynamic programming with examples such as Kanpsack, All pair shortest paths – Warshal’s and Floyd’s algorithms, Resource allocation problem.
Backtracking, Branch and Bound with examples such as Travelling Salesman Problem,
Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of subsets.

Unit -V
Selected Topics: Algebraic Computation, Fast Fourier Transform, String Matching, Theory of NP-completeness, Approximation algorithms and Randomized algorithms.

References:

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, “Introduction to the Design and Analysis of Algorithms”, Mc Graw Hill, 2005.
3. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms",
4. Berman, Paul,” Algorithms”, Cengage Learning.
5. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.

ECS-503: Object Oriented Techniques

UNIT I

Introduction: The meaning of Object Orientation, object identity, Encapsulation, information hiding, polymorphism, generosity, importance of modeling, principles of modeling, object oriented modeling, Introduction to UML, conceptual model of the UML, Architecture.

UNIT II

Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Class &Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Collaboration Diagrams: Terms, Concepts, depicting a message, polymorphism in collaboration Diagrams, iterated messages, use of self in messages. Sequence Diagrams: Terms, concepts, depicting asynchronous messages with/without priority, callback mechanism, broadcast messages.

Basic Behavioral Modeling: Use cases, Use case Diagrams, Activity Diagrams, State Machine , Process and thread, Event and signals, Time diagram, interaction diagram, Package diagram.

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT III

Object Oriented Analysis, Object oriented design, Object design, Combining three models, Designing algorithms, design optimization, Implementation of control, Adjustment of inheritance, Object representation, Physical packaging, Documenting design considerations. Structured analysis and structured design (SA/SD), Jackson Structured Development (JSD). Mapping object oriented concepts using non-object oriented language, Translating classes into data structures, Passing arguments to methods, Implementing inheritance, associations encapsulation.

Object oriented programming style: reusability, extensibility, robustness, programming in the large. Procedural v/s OOP, Object oriented language features. Abstraction and Encapsulation.

UNIT IV

Introduction to Java, History, Features, Object Oriented concept of Java, Classes and Objects, Inheritance, Packages, Interface , abstract method and classes, Polymorphism, Inner classes, String Handling, I/O , Networking, Event Handling. Multi threading, Collection, Java APIs,
Java Beans: Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB).

UNIT V

Java Swing: Introduction to AWT, AWT v/s Swing, Creating a Swing Applet and Application.
Utility of Java as internet programming language, JDBC, The connectivity model, JDBC/ODBC Bridge, Introduction to servlets.

References:

1. James Rumbaugh et. al, “Object Oriented Modeling and Design”, PHI
2. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education
3. Naughton, Schildt, “The Complete Reference JAVA2”, TMH
4. Mark Priestley “Practical Object-Oriented Design with UML”, TMH
5. Booch, Maksimchuk, Engle, Young, Conallen and Houstan, “Object Oriented Analysis and Design with Applications”, Pearson Education
6. Pandey, Tiwari, “ Object Oriented Programming with JAVA” , Acme Learning

ECS-504: Computer Graphics

Unit – I

Introduction and Line Generation**:** Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations**:** Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces**:** Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Hidden Lines and Surfaces**:** Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

References:

1. Donald Hearn and M Pauline Baker, “Computer Graphics C Version”, Pearson Education
2. Amrendra N Sinha and Arun D Udai,” Computer Graphics”, TMH

3. Donald Hearn and M Pauline Baker, “Computer Graphics with OpenGL”, Pearson education
4. Steven Harrington, “Computer Graphics: A Programming Approach” , TMH
5. Rogers, “ Procedural Elements of Computer Graphics”, McGraw Hill

ECS-505: Graph Theory

Unit -I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and Dijkstra Algorithms.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows

Planer graphs, combinatorial and geometric dual: Kuratowski graphs, detection of planarity, geometric dual, Discussion on criterion of planarity, thickness and crossings.

Unit -IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set subspaces, Matrix representation of graph – Basic concepts; Incidence matrix, Circuit matrix, Path matrix, Cut-set matrix and Adjacency matrix.

Coloring, covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem

Discussion of Graph theoretic algorithm wherever required.

References

1. Deo, N, Graph theory with applications to Engineering and Computer Science, PHI
2. Gary Chartrand and Ping Zhang, Introduction to Graph Theory, TMH
3. Robin J. Wilson, Introduction to Graph Theory, Pearson Education
4. Harary, F, Graph Theory, Narosa
5. Bondy and Murthy: Graph theory and application. Addison Wesley.
6. V. Balakrishnan, Schaum's Outline of Graph Theory, TMH
7. Geir Agnarsson, Graph Theory: Modeling, Applications and Algorithms, Pearson Education

EIT-501: E-Commerce

Unit I :

Introduction: Definition of Electronic Commerce, E-Commerce: technology and prospects, incentives for engaging in electronic commerce, needs of E-Commerce, advantages and disadvantages, framework, Impact of E-commerce on business, E-Commerce Models.

Unit II:

Network Infrastructure for E- Commerce:
Internet and Intranet based E-commerce- Issues, problems and prospects, Network Infrastructure, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Mobile Commerce: Introduction, Wireless Application Protocol, WAP technology, Mobile Information device.

Unit III

Web Security: Security Issues on web, Importance of Firewall, components of Firewall, Transaction security, Emerging client server, Security Threats, Network Security, Factors to consider in Firewall design, Limitation of Firewalls.

Unit IV

Encryption: Encryption techniques, Symmetric Encryption: Keys and data encryption standard, Triple encryption, Secret key encryption; Asymmetric encryption: public and private pair key encryption, Digital Signatures, Virtual Private Network.

Unit V

Electronic Payments: Overview, The SET protocol, Payment Gateway, certificate, digital Tokens, Smart card, credit card, magnetic strip card, E-Checks, Credit/Debit card based EPS, online Banking.

EDI Application in business, E- Commerce Law, Forms of Agreement, Govt. policies and Agenda.

References:

1. Ravi Kalakota, Andrew Winston, “Frontiers of Electronic Commerce”, Addison- Wesley.
2. Pete Lohsin , John Vacca “Electronic Commerce”, New Age International
3. Goel, Ritendra “E-commerce”, New Age International
4. Laudon, “E-Commerce: Business, Technology, Society”, Pearson Education
5. Bajaj and Nag, “E-Commerce the cutting edge of Business”, TMH
6. Turban, “Electronic Commerce 2004: A Managerial Perspective”, Pearson Education

EIT-505 Information Security and Cyber Laws

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services,

Information System Threats and attacks, Classification of Threats and Assessing Damages

Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles.

UNIT-II

Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls,

Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges

UNIT-III

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies

Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection

Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-IV

Security metrics- Classification and their benefits

Information Security & Law, IPR, Patent Law, Copyright Law, Legal Issues in Data mIning Security, Building Security into Software Life Cycle

Ethics- Ethical Issues, Issues in Data and Software Privacy

Cyber Crime Types & overview of Cyber Crimes

References :

1. Godbole,“ Information Systems Security”, Willey
2. Merkov, Breithaupt,“ Information Security”, Pearson Education
3. Yadav, “Foundations of Information Technology”, New Age, Delhi
4. Schou, Shoemaker, “ Information Assurance for the Enterprise”, Tata McGraw Hill
5. Sood,“Cyber Laws Simplified”, Mc Graw Hill
6. Furnell, “Computer Insecurity”, Springer
7. IT Act 2000

ECS-601: Computer Network

Unit -I

Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design, Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II

Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III

Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP, IP packet, IP address, IPv6.

Unit - IV

Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V

Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application. Example Networks - Internet and Public Networks.

References :

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, Computer Networks, Pearson Education
3. W. Stallings, Data and Computer Communication, Macmillan Press
4. Anuranjan Misra, “Computer Networks”, Acme Learning
5. G. Shanmugarathinam, ”Essential of TCP/ IP”, Firewall Media

ECS-602: Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)
Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS.
Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design
Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing
Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products.
Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V: Software Maintenance and Software Project Management
Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

References:

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
4. Pankaj Jalote, Software Engineering, Wiley
5. Carlo Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
6. Ian Sommerville, Software Engineering, Addison Wesley.
7. Kassem Saleh,"Software Engineering", Cengage Learning.
8. Pfleeger, Software Engineering, Macmillan Publication.

ECS-603: Compiler Design

Unit – I

Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Optimization of DFA-Based Pattern Matchers implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit – II

Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables.

Unit – III

Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations and case statements.

Unit – IV

Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit – V

Code Generation: Design Issues, the Target Language. Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, Code Generator.
Code optimization: Machine-Independent Optimizations, Loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis

References:

1. Aho, Sethi & Ullman, "Compilers: Principles, Techniques and Tools”, Pearson Education
2. V Raghvan, “ Principles of Compiler Design”, TMH
3. Kenneth Louden,” Compiler Construction”, Cengage Learning.
4.. Charles Fischer and Ricard LeBlanc,” Crafting a Compiler with C”, Pearson Education

ECS-604 Web Technology

Unit I: Introduction

Introduction to web, protocols governing the web, web development strategies, web applications, web project, web team .

Unit II: Web Page Designing

HTML: list, table, images, frames, forms, CSS;
XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting

Java script: Introduction, documents, forms, statements, functions, objects;
Event and event handling; introduction to AJAX, VB Script, CGI

Unit IV: Server Site Programming

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables and methods, debugging, sharing data between JSP pages, Session, introduction to COM/DCOM.

References

1. Xavier, C, " Web Technology and Design" , New Age International
2. Deitel, "Java for programmers", Pearson Education
3. Ivan Bayross," HTML, DHTML, Java Script, Perl & CGI", BPB Publication.
4. Ramesh Bangia, "Internet and Web Design" , New Age International
5. Jackson, "Web Technologies" Pearson Education
6. Patel and Barik, "Introduction to Web Technology & Internet", Acme Learning

EIT-601: Software Project Management

UNIT-I: Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:

Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
3. Kieron Conway, Software Project Management, Dreamtech Press
4. S. A. Kelkar, Software Project Management, PHI Publication.

EIT-602: ERP

UNIT - I
ERP Introduction, Benefits, Origin, Evolution and Structure**:** Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II
Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III
ERP Marketplace and Marketplace Dynamics**:** Market Overview, Marketplace Dynamics, The Changing ERP Market.

ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture.

Using ERP tool: either SAP or ORACLE format to case study

References:

1. Alexis Leon, "ERP Demystified", Tata McGraw Hill
2. Rahul V. Altekar "Enterprise Resource Planning", Tata McGraw Hill,
3. Vinod Kumar Garg and Venkitakrishnan N K, "Enterprise Resource Planning – Concepts and Practice", PHI
4. Joseph A Brady, Ellen F Monk, Bret Wagner, "Concepts in Enterprise Resource Planning", Thompson Course Technology
5. Mary Summer, "Enterprise Resource Planning"- Pearson Education

ECS-701 DISTRIBUTED SYSTEMS

Unit–I

Characterization of Distributed Systems: Introduction, Examples of distributed Systems, Resource sharing and the Web Challenges. Architectural models, Fundamental Models.

Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks, Lamport's & vectors logical clocks.

Concepts in Message Passing Systems: causal order, total order, total causal order, Techniques for Message Ordering, Causal ordering of messages, global state, termination detection.

Unit-II

Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

Distributed Deadlock Detection: system model, resource Vs communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

Unit–III

Agreement Protocols: Introduction, System models, classification of Agreement Problem, Byzantine agreement problem, Consensus problem, Interactive consistency Problem, Solution to Byzantine Agreement problem, Application of Agreement problem, Atomic Commit in Distributed Database system.

Distributed Resource Management: Issues in distributed File Systems, Mechanism for building distributed file systems, Design issues in Distributed Shared Memory, Algorithm for Implementation of Distributed Shared Memory**.**

Unit–IV

Failure Recovery in Distributed Systems: Concepts in Backward and Forward recovery, Recovery in Concurrent systems, Obtaining consistent Checkpoints, Recovery in Distributed Database Systems.

Fault Tolerance: Issues in Fault Tolerance, Commit Protocols, Voting protocols, Dynamic voting protocols.

Unit –V

Transactions and Concurrency Control: Transactions, Nested transactions, Locks, Optimistic Concurrency control, Timestamp ordering, Comparison of methods for concurrency control.

Distributed Transactions: Flat and nested distributed transactions, Atomic Commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. Replication: System model and group communication, Fault - tolerant services, highly available services, Transactions with replicated data.

References:

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Ramakrishna,Gehrke," Database Management Systems", Mc Grawhill
3. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design", Pearson Education
4. Tenanuanbaum, Steen," Distributed Systems", PHI
5. Gerald Tel, "Distributed Algorithms", Cambridge University Press

ECS-702 DIGITAL IMAGE PROCESSING

UNIT-I

Introduction and Fundamentals

Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain

Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II

Image Enhancement in Spatial Domain

Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV
Morphological Image Processing
Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation
Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-701 Cryptography & Network Security

Unit-I
Introduction to security attacks, services and mechanism, Classical encryption techniques-substitution ciphers and transposition ciphers, cryptanalysis, steganography,
Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II
Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III
Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV
Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V
IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)
.
System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, TMH
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", TMH

ECS-801: Artificial Intelligence

Unit-I
Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Possessing.

Unit-II
Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III
Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV
Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

Unit-V
Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

References:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence – A Modern Approach”, Pearson Education
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, McGraw-Hill
3. E Charniak and D McDermott, “Introduction to Artificial Intelligence”, Pearson Education
4. Dan W. Patterson, “Artificial Intelligence and Expert Systems”, Prentice Hall of India,

Syllabus of Elective Subjects
(Computer Science & Engineering and Information Technology)

EIT-061 Software Quality Engineering

UNIT-I: Introduction
Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Quality Metrics
Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

UNIT-III: Software Quality Management and Models
Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Quality Assurance
Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

UNIT-V: Software Verification, Validation & Testing:
Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

References:

1. Jeff Tian, Software Quality Engineering (SQE), Wiley
2. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

EIT-062 Software Testing

Unit-I: Introduction
Faults, Errors, and Failures, Basics of software testing, Testing objectives, Principles of testing, Requirements, behavior and correctness, Testing and debugging, Test metrics and measurements, Verification, Validation and Testing, Types of testing, Software Quality and Reliability, Software defect tracking.

Unit-II: White Box and Black Box Testing
White box testing, static testing, static analysis tools, Structural testing: Unit/Code functional testing, Code coverage testing, Code complexity testing, Black Box testing, Requirements based testing, Boundary value analysis, Equivalence partitioning, state/graph based testing, Model based testing and model checking, Differences between white box and Black box testing.

Unit-III: Integration, System, and Acceptance Testing
Top down and Bottom up integration, Bi-directional integration, System integration, Scenario Testing, Defect Bash, Functional versus Non-functional testing, Design/Architecture verification, Deployment testing, Beta testing, Scalability testing, Reliability testing, Stress testing, Acceptance testing: Acceptance criteria, test cases selection and execution,

Unit-IV: Test Selection & Minimization for Regression Testing
Regression testing, Regression test process, Initial Smoke or Sanity test, Selection of regression tests, Execution Trace, Dynamic Slicing, Test Minimization, Tools for regression testing, Ad hoc Testing: Pair testing, Exploratory testing, Iterative testing, Defect seeding.

Unit-V: Test Management and Automation
Test Planning, Management, Execution and Reporting, Software Test Automation: Scope of automation, Design & Architecture for automation, Generic requirements for test tool framework, Test tool selection, Testing in Object Oriented Systems.

References:

1. S. Desikan and G. Ramesh, "Software Testing: Principles and Practices", Pearson Education.
2. Aditya P. Mathur, "Fundamentals of Software Testing", Pearson Education.
3. Naik and Tripathy, "Software Testing and Quality Assurance", Wiley
4. K. K. Aggarwal and Yogesh Singh, "Software Engineering", New Age International Publication.

EIT-063 Software Reliability

UNIT-I: Introduction
Defining Software Reliability, Software Reliability Attributes and Specification, Concept of Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

UNIT-II: Software Reliability Metrics
Collection of fault and failure data, Measurement of internal and external product attributes, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Software Reliability indicators, Software Reliability Metrics, Static Code Metrics, Dynamic Metrics.

UNIT-III: Software Reliability Assessment Models
Basics of Reliability Theory, Software Reliability Problem, Modeling Process, Software Reliability Models, Parametric Reliability Growth Models, The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

UNIT-IV: Software Reliability Allocation Models
Software Reliability Allocation Models, Criteria for Model Evaluation, Optimal Reliability Allocation, Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software.

UNIT-V: Software Reliability Techniques
Reliability Techniques: Trending Reliability Techniques, Predicting Reliability Techniques, Error Seeding, Failure Rate, Curve Fitting, Reliability Growth, Models and Tools: Study of tools like CASRE, SARA, SMERFS.

References:

1. John Musa, “Software Reliability Engineering”, McGraw-Hill
2. Fenton, and Pfleeger, “Software Metrics: A Rigorous and Practical Approach”, International Thomson Computer Press
3. Jeff Tian, Software Quality Engineering (SQE), Wiley
4. Stephen H. Kan, Metrics and Models in Software Quality Engineering, Addison-Wesley

ECS-071 COMPUTATIONAL GEOMETRY

UNIT-I
Convex hulls: construction in 2d and 3d, lower bounds; Triangulations: polygon triangulations, representations, point-set triangulations, planar graphs

UNIT-II
Voronoi diagrams: construction and applicat ions, variants; Delayney triangulations: divide-and-conquer, flip and incremental algorithms, duality of Voronoi diagrams, min-max angle properties

UNIT-III
Geometric searching: point-location, fractional cascading, linear programming with prune and search, finger trees, concatenable queues, segment trees, interval trees; Visibility: algorithms for weak and strong visibility, visibility with reflections, art-gallery problems

UNIT-IV
Arrangements of lines: arrangements of hyper planes, zone theorems, many-faces complexity and algorithms; Combinatorial geometry: Ham-sandwich cuts.

UNIT-V
Sweep techniques: plane sweep for segment intersections, Fortune's sweep for Voronoi diagrams, topological sweep for line arrangements; Randomization in computational geometry: algorithms, techniques for counting; Robust geometric computing, Applications of computational geometry;

References:

1. Computational Geometry: An Introduction by Franco P. Preparata and Michael Ian Shamos; Springer Verlag
2. Mark de Berg , Marc van Kreveld , Mark Overmars , and Otfried Schwarzkopf, Computational Geometry, Algorithms and Applications , Springer-Verlag,
3. Ketan Mulmuley, Computational Geometry: An Introduction Through Randomized Algorithms, Prentice-Hall
4. Joseph O'Rourke, Computational Geometry in C, Cambridge University Press

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ECS-072 COMPUTATIONAL COMPLEXITY

UNIT-I
Models of Computation, resources (time and space), algorithms, computability, complexity.

UNIT-II
Complexity classes, P/NP/PSPACE, reduction s, hardness, completeness, hierarchy, relationships between complexity classes.

UNIT-III
Randomized computation and complexity; Logical characterizations, incompleteness; Approximability.

UNIT-IV

Circuit complexity, lower bounds; Parallel computation and complexity; Counting problems; Interactive proofs.

UNIT-V
Probabilistically checkable proofs; Communication complexity; Quantum computation

References:

1. Christos H. Papadimitriou., Combinatorial Optimization: Algorithms and Complexity , Prentice-Hall
2. Sanjeev Arora and Boaz Barak , Complexity Theory: A Modern Approach, Cambridge University Press
3. Steven Homer , Alan L. Selman , Computability and Complexity Theory , Springer

ECS-073 PARALLEL ALGORITHMS

Unit-I:
Sequential model, need of alternative model, parallel computational models such as PRAM, LMCC, Hypercube, Cube Connected Cycle, Butterfly, Perfect Shuffle Computers, Tree model, Pyramid model, Fully Connected model, PRAM-CREW, EREW models, simulation of one model from another one.

Unit-II:
Performance Measures of Parallel Algorithms, speed-up and efficiency of PA, Cost- optimality, An example of illustrate Cost- optimal algorithms- such as summation, Min/Max on various models.

Unit-III:
Parallel Sorting Networks, Parallel Merging Algorithms on CREW/EREW/MCC, Parallel Sorting Networks on CREW/EREW/MCC/, linear array

Unit-IV:
Parallel Searching Algorithm, Kth element, Kth element in X+Y on PRAM, Parallel Matrix Transportation and Multiplication Algorithm on PRAM, MCC, Vector-Matrix Multiplication, Solution of Linear Equation, Root finding.

Unit-V:
Graph Algorithms - Connected Graphs, search and traversal, Combinatorial Algorithms- Permutation, Combinations, Derrangements.

References:

1. M.J. Quinn, “Designing Efficient Algorithms for Parallel Computer”, McGrawHill.
2. S.G. Akl, “Design and Analysis of Parallel Algorithms”
3. S.G. Akl, ”Parallel Sorting Algorithm” by Academic Press

ECS-074 Pattern Recognition

Unit-I
Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II
Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III
Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV
Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V
Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

References:

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, "Pattern Recognition", 4th Edition, Academic Press, 2009.

ECS-075 Data Mining & Data Warehousing

Unit-I
Overview, Motivation(for Data Mining),Data Mining-Definition & Functionalities, Data Processing, Form of Data Preprocessing, Data Cleaning: Missing Values, Noisy Data,(Binning, Clustering, Regression, Computer and Human inspection),Inconsistent Data, Data Integration and Transformation. Data Reduction:-Data Cube Aggregation, Dimensionality reduction, Data

Compression, Numerosity Reduction, Clustering, Discretization and Concept hierarchy generation

Unit-II

Concept Description:- Definition, Data Generalization, Analytical Characterization, Analysis of attribute relevance, Mining Class comparisions, Statistical measures in large Databases. Measuring Central Tendency, Measuring Dispersion of Data, Graph Displays of Basic Statistical class Description, Mining Association Rules in Large Databases, Association rule mining, mining Single-Dimensional Boolean Association rules from Transactional Databases– Apriori Algorithm, Mining Multilevel Association rules from Transaction Databases and Mining Multi-Dimensional Association rules from Relational Databases

Unit-III

Classification and Predictions:

What is Classification & Prediction, Issues regarding Classification and prediction, Decision tree, Bayesian Classification, Classification by Back propagation, Multilayer feed-forward Neural Network, Back propagation Algorithm, Classification methods K-nearest neighbor classifiers, Genetic Algorithm.

Cluster Analysis:

Data types in cluster analysis, Categories of clustering methods, Partitioning methods. Hierarchical Clustering- CURE and Chameleon, Density Based Methods-DBSCAN, OPTICS, Grid Based Methods- STING, CLIQUE, Model Based Method –Statistical Approach, Neural Network approach, Outlier Analysis

Unit-IV

Data Warehousing: Overview, Definition, Delivery Process, Difference between Database System and Data Warehouse, Multi Dimensional Data Model, Data Cubes, Stars, Snow Flakes, Fact Constellations, Concept hierarchy, Process Architecture, 3 Tier Architecture, Data Marting.

Unit-V

Aggregation, Historical information, Query Facility, OLAP function and Tools. OLAP Servers, ROLAP, MOLAP, HOLAP, Data Mining interface, Security, Backup and Recovery, Tuning Data Warehouse, Testing Data Warehouse.

References:

1. M.H.Dunham,"Data Mining:Introductory and Advanced Topics" Pearson Education
2. Jiawei Han, Micheline Kamber, "Data Mining Concepts & Techniques" Elsevier
3. Sam Anahory, Dennis Murray, "Data Warehousing in the Real World : A Practical Guide for Building Decision Support Systems, Pearson Education
4. Mallach,"Data Warehousing System",McGraw –Hill

ECS-076 Distributed Database

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializablity by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

References

1. Silberschatz, orth and Sudershan, Database System Concept', Mc Graw Hill
2. Ramakrishna and Gehrke,' Database Management System, Mc Graw Hill
3. Garcia-Molina, Ullman,Widom,' Database System Implementation' Pearson Education
4. Ceei and Pelagatti,'Distributed Database', TMH
5. Singhal and Shivratri, 'Advance Concepts in Operating Systems' MC Graw Hill

ECS-077 Data Compression

Unit - I:

Compression Techniques: Loss less compression, Lossy Compression, Measures of prefonnance, Modeling and coding, Mathematical *Preliminaries* for Lossless compression: A brief introduction to information theory, Models: Physical models,

Probability models, Markov models, composite source model, Coding: uniquely decodable codes, Prefix codes.

Unit – II:
The Huffman coding algorithm: Minimum variance Huffman codes, Adaptive Huffman coding: Update procedure, Encoding procedure, Decoding procedure. Golomb codes, Rice codes, Tunstall codes, Applications of Hoffman coding: Loss less image compression, Text compression, Audio Compression.

Unit-III:
Coding a sequence, Generating a binary code, Comparison of Binary and Huffman cding, Applications: Bi-level image compression-The JBIG standard, JBIG2, Image compression. Dictionary Techniques: Introduction, Static Dictionary: Diagram Coding, Adaptive Dictionary. The LZ77 Approach, The LZ78 Approach, Applications: File Compression-UNIX compress, Image Compression: The Graphics Interchange Format (GIF), Compression over Modems: V.42 bits, Predictive Coding: Prediction with Partial match (ppm): The basic algorithm, The ESCAPE SYMBOL, length of context, The Exclusion Principle, The Burrows-Wheeler Transform: Move-to-front coding, CALIC, JPEG-LS, Multi-resolution Approaches, Facsimile Encoding, Dynamic Markoy Compression.

Unit – IV:
Distortion criteria, Models, Scalar Ouantization: The Quantization problem, Uniform Quantizer, Adaptive Quantization, Non uniform Quantization.

Unit-V:
Advantages of Vector Quantization *over* Scalar Quantization, The Linde-Buzo-Gray Algorithm, Tree structured Vector Quantizers. Structured *Vector* Quantizers.

References:

1. Khalid Sayood, Introduction to Data Compression, Morgan Kaufmann Publishers

EIT-071 Discrete Structures

Unit-I
Set Theory: Introduction, Combination of sets, Multisets, Ordered pairs. Proofs of some general identities on sets.
Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations.
Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions. Growth of Functions.
Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases. Proof Methods, Proof by counter – example, Proof by contradiction.

Unit-II
Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields, Integers Modulo *n*.

Unit-III

Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.
Lattices: Definition, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.
Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference
Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.

Unit-V

Trees : Definition, Binary tree, Binary tree traversal, Binary search tree.
Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs,
Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring
Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle

References:

1. Liu and Mohapatra, "Elements of Distcrete Mathematics", McGraw Hill
2. Jean Paul Trembley, R Manohar, Discrete Mathematical Structures with Application to Computer Science, McGraw-Hill
3. R.P. Grimaldi, Discrete and Combinatorial Mathematics, Addison Wesley,
4. Kenneth H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill,
5. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, PHI

EIT-072 THEORY OF AUTOMATA AND FORMAL LANGUAGES

Unit – I

Introduction; Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition tabl e, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transit ion, Language of NFA, Equi valence of NFA and DFA, Minimization of Finite Automata, Distinguis hing one string from other, Myhill-Nerode Theorem

Unit – II

Regular expression (RE) , Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to

Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages . Application of Pumping Lemma, Closure properties of Regu lar Languages, Decision properti es of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine,
Applications and Limitation of FA.

Unit – III
Context free grammar (CFG) and Contex t Freee Languages (CFL): Definition, Examples, Derivation , Derivation trees, Am biguity in Grammer, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless sym bols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Memership, Pumping lemma for CFLs,

Unit – IV
Push Down Automata (PDA): Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG, Two stack PDA

Unit – V
Turing machines (TM): Basic model, definit ion and representatio n, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer
of Integer functions, Universal TM, Chur ch's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction
to recursive function theory

References:

1. Hopcroft, Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education
2. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science : Automata, Languages and Computation", PHI
3. Martin J. C., "Introduction to Languages and Theory of Computations", TMH
4. Papadimitrou, C. and Lewis, C.L., "Elements of the Theory of Computation", PHI

EIT-073 Bioinformatics

Unit I:
Bioinformatics objectives and overviews, Interdisciplinary nature of Bioinformatics, Data integration, Data analysis, Major Bioinformatics databases and tools. Metadata: Summary

& reference systems, finding new type of data online.

Molecular Biology and Bioinformatics: Systems approach in biology, Central dogma of molecular biology, problems in molecular approach and the bioinformatics approach, oerview of the bioinformatics applications.

Unit II:
Basic chemistry of nucleic acids, Structure of DNA, Structure of RNA, DNA Replication, -Transcription, -Translation, Genes- the functional elements in DNA, Analyzing DNA,DNA sequencing. Proteins: Amino acids, Protein structure, Secondary, Tertiary and Quaternary structure, Protein folding and function, Nucleic acid-Protein interaction.

Unit III:

Perl Basics, Perl applications for bioinformatics- Bioperl, Linux Operating System, mounting/unmounting files, tar, gzip / gunzip, telnet, ftp, developing applications on Linux OS, Understanding and Using Biological Databases, Overview of Java, CORBA, XML, Web deployment concepts.

Unit IV:
Genome, Genomic sequencing, expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism. Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented), and controlled vocabularies, general data retrieval techniques: indices, Boolean search, fuzzy search and neighboring, application to biological data warehouses.

Unit V:
Macromolecular structures, chemical compounds, generic variability and its connection to clinical data. Representation of patterns and relationships: sequence alignment algorithms, regular expressions, hierarchies and graphical models, Phylogenetics. BLAST.

References

1. D E Krane & M L Raymer, " Fundamental concepts of Bioinformatics", Perason Education.
2. Rastogi, Mendiratta, Rastogi, "Bioinformatics Methods & applications, Genomics, Proteomics & Drug Discovery" PHI, New Delhi
3. Shubha Gopal et.al. " Bioinformatics: with fundamentals of genomics and proteomics", Mc Graw Hill.
4. O'Reilly, " Developing Bio informatics computer skills", CBS
5. Forsdyke, "Evolutionary Bioinformatics", Springer

EIT -074 IT in Forensic Science

UNIT I

Overview of Biometrics, Biometric Identification, Biometric Verification, Biometric Enrollment, Biometric System Security.

Authentication and Biometrics: Secure Authentication Protocols, Access Control Security Services, Matching Biometric Samples, Verification by humans.

Common biometrics: Finger Print Recognition, Face Recognition, Speaker Recognition, Iris Recognition, Hand Geometry, Signature Verification

UNIT II

Introduction to Information Hiding: Technical Steganography, Linguistic Steganography, Copy Right Enforcement, Wisdom from Cryptography

Principles of Steganography: Framework for Secret Communication, Security of Steganography System, Information Hiding in Noisy Data , Adaptive versus non-Adaptive Algorithms, Active and Malicious Attackers, Information hiding in Written Text.

UNIT III

A Survey of Steganographic Techniques: Substitution systems and Bit Plane Tools, Transform Domain Techniques: - Spread Spectrum and Information hiding, Statistical Steganography, Distortion Techniques, Cover Generation Techniques.

Steganalysis: Looking for Signatures: - Extracting hidden Information, Disabling Hidden Information.

UNIT IV

Watermarking and Copyright Protection: Basic Watermarking, Watermarking Applications, Requirements and Algorithmic Design Issues, Evaluation and Benchmarking of Watermarking system.

Transform Methods: Fourier Transformation, Fast Fourier Transformation, Discrete Cosine Transformation, Mellin-Fourier Transformation, Wavelets, Split Images in Perceptual Bands. Applications of Transformation in Steganography.

UNIT V

Computer Forensics, Rules of evidence, Evidence dynamics, Evidence collection, Data recovery, Preservation of digital evidence, surveillance tools for future warfare,

References:

1. Katzendbisser, Petitcolas, " Information Hiding Techniques for Steganography and Digital Watermarking", Artech House.

2. Peter Wayner, "Disappearing Cryptography: Information Hiding, Steganography and Watermarking 2/e", Elsevier
3. Bolle, Connell et. al., "Guide to Biometrics", Springer
4. John Vecca, "Computer Forensics: Crime scene Investigation", Firewall Media
5. Christopher L.T. Brown, "Computer Evidence: Collection and Preservation", Firewall Media

ECS-081 Real Time System

UNIT-I: Introduction

Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II: Real Time Scheduling

Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III: Resources Sharing

Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority-Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV: Real Time Communication

Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V: Real Time Operating Systems and Databases

Features of RTOS, Time Services, UNIX as RTOS, POSIX
Issues, Charecteristic of Temporal data, Temporal Consistencey, Concurrency Control, Overview of Commercial Real Time databases

References:

1. Real Time Systems by Jane W. S. Liu, Pearson Education Publication.
2. Mall Rajib, “Real Time Systems”, Pearson Education
3. Albert M. K. Cheng , “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley.

ECS-082 Software Project Management

UNIT-I: Introduction and Software Project Planning
Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II: Project Organization and Scheduling
Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III: Project Monitoring and Control
Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV: Software Quality Assurance and Testing
Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Cleanroom process.

UNIT-V: Project Management and Project Management Tools
Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

References:

1. M. Cotterell, Software Project Management, Tata McGraw-Hill Publication.
2. Royce, Software Project Management, Pearson Education
4. Kieron Conway, Software Project Management, Dreamtech Press
5. S. A. Kelkar, Software Project Management, PHI Publication.

ECS-083 Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, “Real-Time Systems”, Kluwer
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

ECS-084 Cryptography & Network Security

Unit-I

Introduction to security attacks, services and mechanism, Classical encryption techniques- substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers.

Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard(DES), Strength of DES, Idea of differential cryptanalysis, block cipher modes of operations, Triple DES

Unit-II

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm,

Advanced Encryption Standard (AES) encryption and decryption

Fermat's and Euler's theorem, Primality testing, Chinese Remainder theorem, Discrete Logarithmic Problem,

Principals of public key crypto systems, RSA algorithm, security of RSA

Unit-III

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA)

Digital Signatures: Digital Signatures, Elgamal Digital Signature Techniques, Digital signature standards (DSS), proof of digital signature algorithm,

Unit-IV

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure.

Authentication Applications: Kerberos

Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management.

Introduction to Secure Socket Layer, Secure electronic, transaction (SET)

System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls

References:

1. William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
2. Behrouz A. Frouzan: Cryptography and Network Security, Tata McGraw Hill
3. Bruce Schiener, "Applied Cryptography". John Wiley & Sons
4. Bernard Menezes," Network Security and Cryptography", Cengage Learning.
5. Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill

ECS-085 Neural Networks

Unit-I:

Neurocomputing and Neuroscience

Historical notes, human Brain, neuron Mode l, Knowledge representation, Al and NN. Learning process: Supervised and unsuperv ised learning, Error correction learning,competitive learning, adaptation, statistical nature of the learning process.

Unit-II:

Data processing

Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, co-variance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III

Multilayered network architecture, back propagation algorithm, heuristics for making BP-algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptran.

Unit-IV

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

References:

1. J.A. Anderson, An Intoduction to Neural Networks, MIT
2. Hagen Demuth Beale, Neural Network Design, Cengage Learning
3. R.L. Harvey, Neural Network Principles, PHI
4. Kosko, Neural Network and Fuzzy Sets, PHI

ECS-086 Natural Language Processing

Unit-I

Introduction to Natural Language Understanding: The study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different levels of Language Analysis, Representations and Understanding, Organization of Natural language Understanding Systems, Linguistic Background: An outline of English syntax.

Unit-II

Introduction to semantics and knowledge representation, Some applications like machine translation, database interface.

Unit-III

Grammars and Parsing: Grammars and sentence Structure, Top-Down and Bottom-Up Parsers, Transition Network Grammars, Top- Down Chart Parsing. Feature Systems and Augmented Grammars: Basic Feature system for English, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks.

Unit-IV

Grammars for Natural Language: Auxiliary Verbs and Verb Phrases, Movement Phenomenon in Language, Handling questions in Context-Free Grammars. Human preferences in Parsing, Encoding uncertainty, Deterministic Parser.

Unit-V

Ambiguity Resolution: Statistical Methods, Probabilistic Language Processing, Estimating Probabilities, Part-of-Speech tagging, Obtaining Lexical Probabilities, Probabilistic Context-Free Grammars, Best First Parsing. Semantics and Logical Form, Word senses and Ambiguity, Encoding Ambiguity in Logical Form.

References:

1. Akshar Bharti, Vineet Chaitanya and Rajeev Sangal, NLP: A Paninian Perspective, Prentice Hall, New Delhi
2. James Allen, Natural Language Understanding, Pearson Education
3. D. Jurafsky, J. H. Martin, Speech and Language Processing, Pearson Education
4. L.M. Ivansca, S. C. Shapiro, Natural Language Processing and Language Representation
5. T. Winograd, Language as a Cognitive Process, Addison-Wesley

ECS-087 Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III
Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV
Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V
Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications.

References:

1. J. Schiller, Mobile Communications, Addison Wesley.
2. Charles Perkins, Mobile IP, Addison Wesley.
3. Charles Perkins, Ad hoc Networks, Addison Wesley**.**
4. Upadhyaya, “Mobile Computing”, Springer

ECS-088 Soft Computing

Unit-I:
ARTIFICIAL NEURAL NETWORKS
Basic concepts - Single layer perception - Multilayer Perception - Supervised and Unsupervised learning – Back propagation networks - Kohnen's self organizing networks - Hopfield network.

Unit-II:
FUZZY SYSTEMS
Fuzzy sets, Fuzzy Relations and Fuzzy reasoning, Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making.

Unit-III:
NEURO - FUZZY MODELING
Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls - Simulated annealing – Evolutionary computation.

Unit-IV:
GENETIC ALGORITHMS
Survival of the Fittest - Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method.

Unit-V:
APPLICATION OF SOFT COMPUTING
Optimiation of traveling salesman problem using Genetic Algorithm, Genetic algorithm based Internet Search Techniques, Soft computing based hybrid fuzzy controller, Intoduction to MATLAB Environment for Soft computing Techniques.

References:

1. Sivanandam, Deepa, " Principles of Soft Computing", Wiley
2. Jang J.S.R, Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall
3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill
4. Laurene Fausett, "Fundamentals of Neural Networks", Prentice Hall
5. D.E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley
6. Wang, "Fuzzy Logic", Springer

EIT-081 Digital Image Processing

UNIT-I
Introduction and Fundamentals
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

Image Enhancement in Frequency Domain
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass; Correspondence Between Filtering in Spatial and Frequency Domain; Smoothing Frequency Domain Filters – Gaussian Lowpass Filters; Sharpening Frequency Domain Filters – Gaussian Highpass Filters; Homomorphic Filtering.

UNIT-II
Image Enhancement in Spatial Domain
Introduction; Basic Gray Level Functions – Piecewise-Linear Transformation Functions: Contrast Stretching; Histogram Specification; Histogram Equalization; Local Enhancement; Enhancement using Arithmetic/Logic Operations – Image Subtraction, Image Averaging; Basics of Spatial Filtering; Smoothing - Mean filter, Ordered Statistic Filter; Sharpening – The Laplacian.

UNIT-III
Image Restoration
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering – Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters; Minimum Mean-square Error Restoration.

UNIT-IV
Morphological Image Processing
Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening

UNIT-V Registration
Introduction, Geometric Transformation – Plane to Plane transformation, Mapping, Stereo Imaging – Algorithms to Establish Correspondence, Algorithms to Recover Depth

Segmentation
Introduction, Region Extraction, Pixel-Based Approach, Multi-level Thresholding, Local Thresholding, Region-based Approach, Edge and Line Detection: Edge Detection, Edge Operators, Pattern Fitting Approach, Edge Linking and Edge Following, Edge Elements Extraction by Thresholding, Edge Detector Performance, Line Detection, Corner Detection.

References:

1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.
2. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
3. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

EIT-082 Multimedia Systems

Unit-I: Introduction
Introduction to Multimedia, Multimedia Information, Multimedia Objects, Multimedia in business and work. Convergence of Computer, Communication and Entertainment products

Stages of Multimedia Projects
Multimedia hardware, Memory & storage devices, Communication devices, Multimedia software's, presentation tools, tools for object generations, video, sound, image capturing, authoring tools, card and page based authoring tools.

Unit-II: Multimedia Building Blocks
Text, Sound MIDI, Digital Audio, audio file formats, MIDI under windows environment Audio & Video Capture.

Unit-III: Data Compression
Huffman Coding, Shannon Fano Algorithm, Huffman Algorithms, Adaptive Coding, Arithmetic Coding Higher Order Modelling. Finite Context Modelling, Dictionary based Compression, Sliding Window Compression, LZ77, LZW compression, Compression, Compression ratio loss less & lossy compression.

Unit-IV: Speech Compression & Synthesis
Digital Audio concepts, Sampling Variables, Loss less compression of sound, loss compression & silence compression.

Unit-V: Images
Multiple monitors, bitmaps, Vector drawing, lossy graphic compression, image file formatic animations Images standards, JPEG Compression, Zig Zag Coding, Multimedia Database.Content based retrieval for text and images,**Video:**Video representation, Colors, Video Compression, MPEG standards, MHEG Standard Video Streaming on net, Video Conferencing, Multimedia Broadcast Services, Indexing and retrieval of Video Database, recent development in Multimedia.

References:

1. Tay Vaughan, “Multimedia, Making IT Work”, McGraw Hill.
2. Buford, “Multimedia Systems”, Addison Wesley.
3. Mark Nelson, “Data Compression Hand Book”, BPB.
4. Sleinreitz, “Multimedia System”, Addison Wesley.

Syllabus Applicable

in

Gautam Buddh Technical University
Lucknow

is adopted by the Executive Council of

Mahamaya Technical University
Noida

vide resolution no.13, dated 24 Feb, 2011

for batches admitted in session: 2010-11

B.TECH.

1. Electronics Engineering
2. Electronics & Communication Engineering
3. Electronics & Telecommunication Engineering

4th Year

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA

Study and Evaluation Scheme B. Tech. In Electronics Engg / Electronics & Communication Engg / Electronics & Telecomm Engg

[Effective from the session: 2013-14]

YEAR 4th ,SEMESTER-VI I

S.No.	Subject Code	Subject Name	Periods			Evaluation Scheme				Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	TOT			
THEORY SUBJECTS											
1.	EOE 07*	Open Elective – I**	3	1	0	30	20	50	100	150	4
2.	EOE 02*	Departmental Elective – II	3	1	0	30	20	50	100	150	4
3.	EEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	EEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	EEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	EEC 751	Microwave & Fiber Optics Lab.	0	0	2	-	20	20	30	50	1
8.	EEC 752	Electronics Circuit Design Lab.	0	0	3	-	20	20	30	50	2
9.	EEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10	EEC 754	Project	0	0	2	-	50	50	-	50	1
11.	GP 701	General Proficiency	-	-	-	-	-	50	-	50	-
Total			15	5	9	150	240	440	560	1000	25

** Open Elective-I

EOE-071	Entrepreneurship Development
EOE-072	Quality Management
EOE-073	Operation Research
EOE-074	Introduction to Biotechnology
EOE-075/EIC-034	Micro and Smart Systems

MAHAMAYA TECHNICAL UNIVERSITY, NOIDA
Study and Evaluation Scheme B. Tech. in Electronics Engg/ Electronics & Communication Engg/ Electronics & Telecomm Engg
[Effective from the session 2013-14]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	EOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	EEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	EEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	EEC 802	Electronics Switching	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	EEC 851	Project	0	0	12	-	100	100	250	350	8
7.	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

EOE-081 Non Conventional Energy Resources
EOE-082 Nonlinear Dynamic system
EOE-083 Product Development
EOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – I

1. EEC 011 Analog Signal Processing
2. EEC 012 Data Structure
3. EEC 013 Advance Semiconductor Devices
4. EEC 014 Microcontrollers

Elective – II

1. EEC 021 Satellite Communication
2. EEC 022 Digital Image Processing
3. EEC 023 ANN
4. EEC 024 Filter Design

Elective – III

1. EEC 031 Optical Networks
2. EEC 032 Digital System Design using VHDL
3. EEC 033 Speech Processing
4. EEC 034 Integrated Circuit Technology
5. EEC 035 Introduction to RADAR systems

SYLLABUS

EEC 701 OPTICAL COMMUNICATION		3 1 0
UNIT	TOPICS	LECTURES
I	Overview of optical fiber communication- The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber Material and its Fabrication Techniques	8
II	Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Fiber dispersion measurement techniques, Non linear effects. Optical fiber Connectors: Joints, Couplers and Isolators.	8
III	Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser: Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD	8
IV	Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers	8
V	Link Design: Point to Point Links, Power Penalities, Error control,Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter	8

TEXT BOOKS:

1. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, "Optical Fiber Communications", TMH, 4th Edition, 2008.

REFERENCE BOOKS

1. Govind P. Agrawal, "Fiber Optic Communication Systems", John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, "Fiber Optic Communication", Pearson Education, 4th Ed, 2004.

EEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	**Topic**	**Lectures**
I	Introduction to Networks & Data Communications The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.	8
II	Switching: Datagram Networks, Virtual Circuit Networks, Structure of a switch ,Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol	8
III	Multiple Access : RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN IEEE 802.11, Bluetooth IEEE 802.16	8
IV	Network Layer : Design Issues. Routing Algorithms. Congestion control Algorithms.IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram	8
V	Transport Layer Protocol : UDP and TCP, ATM ATM, Cryptography, Network Security	8

Text Books:

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007

Reference Books:

1. A. S. Tanenbaum, "Computer Networks", PHI.
2. W. Stallings, "Data and Computer Communication", PHI.

EEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality. MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design. MOS Transistor : MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances	8
II	MOS Inverters: Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter. MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.	8
III	Combinational MOS Logic Circuits: Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates) Sequential MOS Logic Circuits: Introduction, behaviour bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
3. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES II

EEC 021 SATELLITE COMMUNICATIONS		3 1 0
Unit	**Topic**	**Lectures**
I	Elements of Satellite Communication. Orbital mechanics, look angle and orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.	8
II	Satellite subsystems, attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.	8
III	Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary,	8
IV	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing accuracy, GPS Receiver Operation	8
V	Global Mobile Satellite Systems, Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna(MSA), Low gain omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.	8

Text/ Reference Books:

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4th Ed.
3. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
4. R. Pandya, “Mobile and Personal Communication Systems and Services ”, PHI.

EEC 022 DIGITAL IMAGE PROCESSING		3 1 0
Unit	**Topic**	**Lectures**
I & II	Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, sampling & quantization, basic relationships between pixels, colour image model. Image Transforms: One-dimensional & two-dimensional DFT, cosine, sine, Hadamard, Haar, and Slant & KL transforms. Image Enhancement: Introduction, point operations, histogram modelling, spatial operations, Transform operations.	8
III	Image Restoration: Introduction, image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.	8
IV	Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding	8
V	Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.	8

Text Books:

1. Rafael C. Gonzalez Richard E Woods, "Digital Image Processing", Pearson, 3rd Ed. 2009.
2. Anil K Jain, "Fundamentals of Digital Image Processing", PHI.

EEC 023 Artificial Neural Networks		3 1 0
Unit	Topic	Lectures
I	Introduction: Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks. Learning Process: Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory and adaptation.	4 4
II	Artificial neurons, Neural networks and architectures Introduction, neuron signal function, mathematical preliminaries, Feed forward & feedback architecture. Geometry of Binary threshold neurons and their networks Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.	2 3
III	Perceptrons and LMS Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α – LMS learning, MSE error surface, steepest descent search, μ – LMS and application. Back propagation and other learning algorithms Multilayered architecture, back propagation learning algorithm, practical considerations, structure growing algorithms, applications of feed forward neural networks, reinforcement learning	5
IV	Statistical Pattern Recognition Bayes' theorem, classical decisions with Bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems. RBF Networks Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons. Stochastic Machines Statistical mechanics, simulated annealing, Boltzmann machine.	4 2 2
V	Adaptive Resonance Theory Building blocks of adaptive resonance, Adaptive Resonance Theory 1. Self Organizing Feature MAP Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, Mexican hat networks.	8

Text Books:

1. Kumar Satish, "Neural Networks", TMH
2. Simon Haykin, "Neural Networks", PHI
3. J. M. Zurada, "Introduction to Artificial Neural Systems", Jaico Publishers, 3rd Ed.

EEC 024 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Review of op-amps circuits, Categorization of filters-Low-pass filter, High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and Delay equalizers.	8
II	Approximation Theory: Butterworth approximation, Chebyshev approximation, Inverse Chebyshev approximation, Basic of sensitivity, Frequency Transformations.	8
III	Three amplifier Biquad: Basic low pass and band pass circuit, realization of the general Biquadratic Functions, summing of four Amplifier biquad, feed forward three amplifier biquad, Passive Ladder structures, Inductor Substitution using Gyrator, Transformation of elements using the FDNR. Active ladder filters. Active R filters.	10
IV	Elementary transconductor building blocks, resistors, integrators, amplifiers, summers, gyrator, First and second order filters, higher order filters.	8
V	Switched capacitor filters: The MOS switch, The switched capacitor, first order building blocks, second order sections, sampled data operation, Switched capacitor first and second order filters, Bilinear transformation based SC filter design.	6

Text Book:

[1] Gobind Daryanani, “Principles of active network synthesis and design”,John Wiley & Sons.

[2] R. Schaumann, M. E. Van Valkenburg, “Design of analog filters”, Oxford University Press.

EEC 751 Microwave and Optical Communication Lab

Minimum Ten Experiments to be conducted:

Part – A (Any 6 Experiments):

1. Study of Reflex Klystron Characteristics.
2 Measurement of guide wavelength and frequency of the signal in a rectangular Waveguide using slotted line carriage in a Micro wave Bench.
3. Measurement of impedance of an unknown load connected at the output end of the slotted line carriage in a Micro wave Bench
4. Determine the S-parameter of any Three port Tee.
5 Determine the S-parameter of a Magic Tee.
6. Study various parameters of Isolator .
7. Measurement of attenuation of a attenuator and isolation, insertion loss, cross coupling of a circulator.
8 Determine coupling coefficient, Insertion loss, Directivity and Isolation coefficient of anty Multi-Hole directional coupler.
9 To study working of MIC Components like Micro strip Line, Filter, Directional Coupler, Wilkinson Power Divider, Ring resonator & coupler, antennas & amplifies.
10. Study of waveguide horn and its radiation pattern and determination of the beam width.
11. Study radiation pattern of any two types of linear antenna.

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

EEC 752 Electronic Circuit Design

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make a hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.
5. A report is to be made for evaluation.

EEC 801 Mobile and Wireless Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels. Small scale Multipath Measurements, Parameters of Mobile Multipath Channels types of small scale fading.	8
II	Fundamentals of equalisation, Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver. Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.	8
III	Cellular concepts, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	8
IV	GSM system for mobile: Services and features, System Architecture, Radio Sub system Channel types, Frame Structure. CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel	8
V	Introduction to Mobile Adhoc Networks, Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson, Second Edition.
2. T L Singal ,“Wireless Communications ”,McGraw Hill Publications.
3. R. Pandya, “ Mobile and personal communication system”, PHI.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University press.
2. Andreas F. Molisch, “Wireless Communications”, Wiley Student Edition.
3. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

EEC 802 ELECTRONIC SWITCHING			3 1 0
Unit	Topic	Text Book/ Chapter	Lectures
I	Evolution of Switching systems: Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.	2/3	8
II	Digital switching: Switching functions, space division switching, Time division switching, two dimensional switching, Digital cross connect systems, digital switching in analog environment.	3/5	8
III	Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modelling switching systems, incoming traffic and service time characterization, blocking models and loss estimates, Delay systems.	1/8	8
IV	Control of Switching Systems: Introduction, Call processing functions; common control, Reliability availability and security; Stored program control. Signalling: Introduction, Customer line signalling, AF junctions and trunk circuits, FDM carrier systems, PCM and inter register signalling, Common channel signalling principles, CCITT signalling system No. 6 and 7, Digital customer line signalling.	2/7 2/8	8
V	Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching, ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.	3/10	8

Text Books:

1. Thiagarajan Viswanathan, “Telecommunication switching System and networks”, PHI.
2. J.E. Flood, “Telecommunication switching, Traffic and Networks”, Pearson education.
3. J.C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

ELECTIVE III

EEC 031 OPTICAL NETWORKS		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Networks- Principles and Challenges and its Generation, Characteristics of Optical Fiber in non linear region ,Optical Packet Switching, Transmission Basics, Multiplexers & Filters,	8
II	Optical Amplifiers ,Tunable Lasers, Switches, Wavelength Converters. Sub-Carrier Modulation and Multiplexing,Spectral efficiency,Crosstalk,Introduction of Soliton systems.	8
III	SONET/SDH: Multiplexing, SONET/ SDH Layers, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure, Ethernet. Optical Transport Network, Generic framing Procedure, IP routing and forwarding and QOS. WDM Network Elements Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations- SONET/SDH core Network	

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, “Optical Networks a Practical perspective”, Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee “Optical WDM Networks” Springer Pub 2006.

EEC 032 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

TEXT BOOKS:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.

REFERENCE BOOKS:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

EEC 033 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	10
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	10
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, “Digital Processing of speech signals”, Pearson Education.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley India Edition, 2006.

EEC 034 INTEGRATED CIRCUIT TECHNOLOGY		3 1 0
Unit	Topic	Lectures
I	Introduction To IC Technology: SSI, MSI, LSI, VLSI Integrated Circuits Crystal Growth and Wafer Preparation: Electronic Grade Silicon, Czochralski Crystal Growth, Silicon Shaping, Processing Considerations. Epitaxy: Vapor –Phase Epitaxy, Molecular Beam Epitaxy, Silicon on Insulators, Epitaxial Evaluation.	8
II	Oxidation: Growth Kinetics, Thin Oxides, Oxidation Techniques and Systems, Oxides Properties. Lithography: Optical Lithography. Photo masks, Wet Chemical Etching. Dielectric and Polysilicon Film Deposition: Deposition Processes, Polysilicon , Silicon Dioxide, Silicon Nitride.	8
III	Diffusion: Diffusion of Impurities in Silicon and Silicon Dioxide, Diffusion Equations, Diffusion Profiles, Diffusion Furnace, Solid, Liquid and Gaseous Sources , Sheet Resistance and its Measurement. Ion-Implantation: Ion-Implantation Technique, Range Theory, Implantation Equipment.	8
IV	Metallization: :Metallization Application, Metallization Choices, Physical Vapor Deposition, Vacuum Deposition, Sputtering Apparatus. Packaging of VLSI devices: Package Types, Packaging Design Consideration, VLSI Assembly Technologies, Package Fabrication Technologies.	8
V	VLSI Process Integration: Fundamental Considerations For IC Processing, NMOS IC Technology, CMOS IC Technology, Bipolar IC Technology, Monolithic and Hybrid Integrated Circuits, IC Fabrication	8

Text Book:

1. S. M. Sze, "VLSI Technology", 2nd Edition, McGraw –Hill Publication.

Reference Books:

1. S.K. Ghandhi, "VLSI Fabrication Principles", 2nd Edition,. Willy-India Pvt. Ltd.
2. J. D. Plummer, M. D. Deal and Peter B. Griffin, "Silicon VLSI Technology: Fundamentals, practice and modelling", Pearson Education.
3. Stephen A. Campbell, "Fabrication Engineering at the micro and nano scale", Oxford Univ Press.

EEC 035 INTRODUCTION TO RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to Radar: Basic Radar, The Simply Form of the Radar Equations, Radar Block Diagram, Radar Frequencies, Applications of Radar. The Radar Equation: Detection of Signals in Noise, Receiver Noise and the Signal-to-Noise Ratio, Probabilities of Detection and False Alarm, Integration of Radar Pulses, Radar Cross Section of Targets, Radar Cross-Section of Targets, Radar Cross-Section Fluctuations, Transmitter Power, Pulse Repetition Frequency, Antenna Parameters, System Losses, Problems	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay-Line Cancelers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: Tracking with Radar, Mono pulse Tracking, Conical Scan and Sequential Lobing, Limitations to tracking Accuracy, Low-Angle Tracking, Tracking in Range, Other Tracking Radar Topics, Comparison of Trackers, Automatic Tracking with Surveillance Radars(ADT)	8
IV	Detection of Signals in Noise: Introduction, Detection Criteria, Detectors, Automatic Detection, Integrators, Constant-False-Alarm Rate Receivers.	8
V	Information from Radar Signals: Basic Radar Measurements, Theoretical Accuracy of Radar Measurements, Ambiguity Diagram, Pulse Compression, Target Recognition, Land Clutter, Sea Clutter, Weather Clutter	8

Text/ Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems" Third Edition.
2. J.C. Toomay , Paul J. Hannen " Principles of Radar" Third Edition.

EIC-034/EOE-075 MICRO AND SMART SYSTEMS		3 1 0
UNIT	TOPICS	LECTURES
I	Introduction, Why miniaturization?, Microsystems versus MEMS, Why micro fabrication?, smart materials, structures and systems, integrated Microsystems, applications of smart materials and Microsystems,.	5
II	Micro sensors, actuators, systems and smart materials: Silicon capacitive accelerometer, piezoresistive pressure sensor, conductometric gas sensor, an electrostatic combo-drive, a magnetic microrelay, portable blood analyzer, piezoelectric inkjet print head, micromirror array for video projection, smart materials and systems.	8
III	Micromachining technologies: silicon as a material for micro machining, thin film deposition, lithography, etching, silicon micromachining, specialized materials for Microsystems, advanced processes for micro fabrication.	8
IV	Modeling of solids in Microsystems: Bar, beam, energy methods for elastic bodies, heterogeneous layered beams, bimorph effect, residual stress and stress gradients, poisson effect and the anticlastic curvature of beams, torsion of beams and shear stresses, dealing with large displacements, In-plane stresses. Modelling of coupled electromechanical systems: electrostatics, Coupled Electro-mechanics: statics, stability and pull-in phenomenon, dynamics. Squeezed film effects in electro-mechanics.	8
V	Integration of micro and smart systems: integration of Microsystems and microelectronics, microsystems packaging, case studies of integrated Microsystems, case study of a smart-structure in vibration control. Scaling effects in Microsystems: scaling in: mechanical domain, electrostatic domain, magnetic domain, diffusion, effects in the optical domain, biochemical phenomena.	

Text book:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalakrishnan, K. N. Bhat and V. K. Atre, “Micro and smart systems”, Wiley India, 2010.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004.

NEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, “Computer Networks” Pearson.
5. Ajit Pal, “Data Communication and Computer Networks”, PHI
6. Dimitri Bertsekas, Robert G. Gallager, “Data Networks”, Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins,“ Carrier-Grade VoIP”, McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, “IP Telephony – Deploying Voice Over-IP Protocols”, John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, “Analog Filter Design”, 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,”Applications and Design with Analog Integrated Circuits”, Second edition, Pearson.

2. T. Deliyannis, Yichuang Sun, J.K. Fidler, “Continuous-Time Active Filter Design”, CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED's and photo detector.

NEC 752 Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, “Optical Networks a Practical perspective”, Morgan Kaufmann Publishers, 3^{rd} Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee “Optical WDM Networks” Springer Pub 2006.

ELECTIVE IV

	NEC 041 ELECTRONIC SWITCHING	3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, “Telecommunication Switching Systems and Networks”, PHI.

2. J.E. Flood, “Telecommunication Switching, Traffic and Networks”, Pearson Education.

3. John C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. J Bhasker , "VHDL Primer" –Pearson Education.

Reference Books:

3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, “Digital Processing of speech signals”, Pearson Education.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , "Handbook of Visual Display Technology", Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik " Introduction to Radar Systems", Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen "Principles of Radar", PHI Learning.
3. B.Pratt, A.Bostian, "Satellite Communications", Wiley India.
4. D.Roddy, "Satellite Communications", TMH.

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-701	ELECTRIC DRIVES	3	1	0	30	20	50	100	150	4
2	NEE-702	POWER STATION PRACTICE	3	1	0	30	20	50	100	150	4
3	NEC-702A	ANALOG & DIGITAL COMMUNICATION	3	1	0	30	20	50	100	150	4
4	NEE-031-033, NCS-039	DEPARTMENTAL ELECTIVE-III	3	1	0	30	20	50	100	150	4
5	NOE-071-NOE-074	OPEN ELECTIVE-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
6	NEE-751	ELECTRIC DRIVE LAB	0	0	3	10	10	20	30	50	1
7	NEC-752B	ADC LAB	0	0	3	10	10	20	30	50	1
8	NEE-753	INDUSTRIAL TRAINING	0	0	2	30	20	50	--	50	1
9	NEE-754	PROJECT	0	0	2	30	20	50	--	50	1
10	NGP-701	GP					50	50	--	50	1
		TOTAL	16	5	10					1000	24

LIST OF DEPARTMENTAL ELECTIVE-III

NEE-031 POWER SYSTEM OPERATION AND CONTROL
NEE-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEE-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I

NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATION RESEARCH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-801	ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS	3	1	0	30	20	50	100	150	4
2	NEE-802	UTILIZATION OF ELECTRICAL ENERGY AND TRACTION	3	1	0	30	20	50	100	150	3
3	NEE-041 - NEE-044	DEPARTMENTAL ELECTIVE-IV	3	1	0	30	20	50	100	150	4
4	NOE-081 - NOE-084	OPEN ELECTIVE-2	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-851	PROJECT	0	0	12	0	100	100	250	350	8
6	NGP-801	GP					50	50	-	50	1
		TOTAL	14	5	12		180	350	650	1000	24

LIST OF DEPARTMENTAL ELECTIVE IV

NEE-041 EHVAC&DC TRANSMISSION
NEE-042 POWER QUALITY
NEE-043 EMBEDDED SYSTEM
NEE-044 SCADA

LIST OF OPEN ELECTIVE 2

NOE-081 NON-CONVENTIONAL ENERGY RESOURCES
NOE-082 NON LINEAR DYNAMIC SYSTEMS
NOE-083 DATA BASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING
NOE-084 AUTOMATION & ROBOTICS

NEE701/NEN 701: Electric Drives

L T P
3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation
Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive
Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors
Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited DC motor drives (continuous conduction only), dual converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited DC motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:
Three Phase induction Motor Drive:
Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
Three Phase Synchronous motor:
Self controlled scheme
Special Drives:
Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:
1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K. Pillai, “A First Course on Electric Drives”, New Age International.
3. B.N. Sarkar, “Fundamental of Industrial Drives”, Prentice Hall of India Ltd.

Reference Books:
1 M. Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V. Subrahmanyam, “Electric Drives: Concepts and Applications”, TataMcGraw Hill.

NEE 702/NEN702: POWER STATION PRACTICE

L T P
3 1 0

UNIT-I:Introduction: Electric energy demand and growth in India, electric energy sources.
Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.
Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.
Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.
Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.
Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V:Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:
1. B.R. Gupta, “Generation of Electrical Energy”, S. Chand Publication.
2. Soni, Gupta & Bhatnagar, “A text book on Power System Engg.”, Dhanpat Rai & Co.
3. P.S.R. Murthy, “Operation and control of Power System” BS Publications, Hyderabad.

Reference Books:
4. W. D. Stevenson, “Elements of Power System Analysis”, McGraw Hill.
5. S. L. Uppal, “Electrical Power”, Khanna Publishers.

NEC702A Analog & Digital Communication

UNIT I:

Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:

Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:

Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:

Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin,“ Communication Systems” John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,” Electronic Communication Systems” 4th Edition, Tata McGraw Hill
3. Simon Haykin, “Digital Communications” John Wiley & Sons
4. T.L. Singal, “Analog & Digital Communication”, Tata Mc Graw Hill

Reference Books:

1. B.P. Lathi, “Modern Analog & Digital Communication Systems” Oxford University Press.
2. Taub & Schilling, “Communication System: Analog and Digital” Tata Mc Graw Hill
3. R.P. Singh & S.D. Sapre, “Communication Systems Analog and Digital” Tata McGraw Hill.

NEE –031/NEN-031: POWER SYSTEM OPERATION AND CONTROL

L T P
3 1 0

UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
1. D.P. Kothari & I.J. Nagrath, “Modern Power System Analysis” Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, “Operation and control in Power Systems” B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, “ Understanding FACTs” Concepts and Technology of Flexible AC Transmission Systems”
4. A. J. Wood & B.F. Wollenburg, “ Power Generation, Operation and Control “ John Wiley & Sons.
Reference Books:
1. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
2. P. Kundur, “ Power System Stability and Control Mc Graw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza,’ Power System Analysis’ Oxford University Press.

NEE-032/NEN032:
ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P
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Unit-I: Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.
16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:
1. Ray, A.K. & Burchandi, K.m., “Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing” Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, “Advanced Microprocessors and Microcontrollers” New Age International.
3. Krishna Kant,”Microprocessors and Microcontrollers” PHI Learning.
4. Brey, Barry B. “The INTEL Microprocessors” Pearson Education.

Reference Books:
1. Ayala, “The 8051 Micro Controller”, Centage Learning.
2. Mazidi M.A., Maizidi J.G. Mckinlay R.D., “The 8051 Microcontroller and Embedded Systems” Pearson Education.
3. Rajkamal, “The concept and feature of microcontrollers 68HC11, 8051 and 8096”, S.Chand Publisher, New Delhi
4. Peatman John, “Design with microcontroller”, Mc.-Graw Hill Publishing.

NEE033/NEN033: FLEXIBLE AC TRANSMISSION SYSTEMS

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3 1 0

UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications
Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications
Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV: Voltage Source Converter Based Facts Controllers
Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability. SSSC-operation of SSSC and the control of power flow – modelling of SSSC in load flow and transient stability studies.

TEXT BOOKS:
1. R.Mohan Mathur, Rajiv K.Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, “Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:
1. A.T. John, “Flexible A.C. Transmission Systems”, Institution of Electrical and Electronic Engineers (IEEE) 1999.
2. V.K. Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, “Flexible AC Transmission System: Modelling and Control” Springer, 2012.

NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

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3 1 0

Unit-I

Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II

Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III

Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV

Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation. Translating object oriented design into implementations.

Unit-V:

Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

Text Books:

1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das "Unix concepts & application" TMH

Reference Books:

1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

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3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV
Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V
ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

NOE-073: OPERATIONS RESEARCH

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.
Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.
Cell Division: Mitosis and Meiosis.

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.
Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication.

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.
Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

NEE – 751: ELECTRIC DRIVES LAB

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Note: - Minimum 10 experiments are to be performed from the following out of which at least three should be simulation based.

(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. To study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recovery control scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

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Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.

NEE801: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

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UNIT – I
Crystal Structure of Materials:
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth
B. Energy bands in solids, classification of materials using energy band.

UNIT – II
Conductivity of Metals:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III
Mechanism of Conduction in semiconductor materials:
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV
Magnetic Properties of Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :
1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S. Chand & Co.

References :
1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2 Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
4 T. K. Basak, "Electrical Engineering Materials" New age International.

NEE – 802: UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

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3 1 0

Unit-I:
Electric Heating:
Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

Unit-II:
Electric Welding:
Electric Arc Welding Electric Resistance welding Electronic welding control
Electrolyte Process:
Principles of electro deposition, Laws of electrolysis, applications of electrolysis

Unit-III
Illumination:
Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems
Refrigeration and Air Conditioning:
Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV:
Electric Traction - I
Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V:
Electric Traction – II
Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:
1. H. Partab, "Art and Science of Electrical Energy" Dhanpat Rai & Sons.
2. G.K. Dubey, "Fundamentals of Electric Drives" Narosa Publishing House

Reference Books:
3. H. Partab, " Modern Electric Traction" Dhanpat Rai & Sons.
4. C.L. Wadhwa, " Generation, Distribution and Utilization of Electrical Energy" New Age International Publications.

NEE–041: EHV AC & DC TRANSMISSION

L T P
3 1 0

UNIT-I:Introduction :
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:EHV AC Transmission :
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.
Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters,
Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :
1.R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern.
2.K. R. Padiyar, "HVDC Power Transmission Systems: Technology and System Reactions" New Age International.
3.J. Arrillaga," High Voltage Direct current Transmission" IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, "High Voltage Engineering" Tata Mc Graw Hill.
Reference Books:
5.M. H. Rashid , " Power Electronics : Circuits, Devices and Applications" Prentice Hall of India.
6.S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Publisher.
7."EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute. Palo Alto, California, 1982.

NEE-042: POWER QUALITY

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Unit-I

Introduction to Power Quality:

Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations**.**

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices- Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, “Electrical Power System Quality” McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, “Power Quality Enhancement Using Custom Power Devices” Kluwer Academic Publishers
3. C. Sankaran, “ Power Quality” CRC Press.

NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, “Real-Time Systems”, Kluwer
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

NEE-044: SCADA

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UNIT I: SCADA:
Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierarchical Structure.
Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

UNIT II: Supervisory and Control Functions:
Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.
Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

UNIT III: MAN- Machine Communication:
Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

UNIT IV: Data basis- SCADA, EMS and network data basis.
SCADA system structure - local system, communication system and central system. Configuration-NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration.
Performance considerations: real time operation system requirements, modularization of software programming languages.

Text Books:
1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis",, Prentice Hall of India,
3. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
4. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11th Edition.

OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

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3 1 0

UNIT-I :Introduction : Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II :Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III :Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV :Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V :Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations.
Waste Recycling Plants.

Text/References Books:
1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle," Renewable Energy Power For A Sustainable Future", Oxford University Press.

NOE-082: NON-LINEAR DYNAMIC SYSTEMS

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3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy); control of chaos.

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE-083 : DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

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3 1 0

Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, data definitions language, DML, overall database structure.
Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.
Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV: Foundation. Introduction to DATA Warehousing. Client / Server Computing model & Data Warehousing. Parallel processors & System. Distributed DBMS implementations. Client /Server RDBMS Solutions.

Unit-V: DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools. Metadata.
Data Mining: Introduction to data mining

Text Books:
1. Korth, Silbertz, Sudarshan, Database Concepts., Mc Graw Hill
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.
4. Mallach, Data Warehousing System., Mc. Graw Hill

Reference Books :
1. Elmasri, Navathe, Fundamentals of Database Systems., Addition Wesley
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
3. Majumdar & Bhattacharya, Database Management System., Tata Mc Graw Hill
4. Ramakrishnan, Gehrke, Database Management System., Mc Graw Hill.

NOE-084: AUTOMATION AND ROBOTICS

L T P
3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automation” Wily Eastern.

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Mechanical Engineering / Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering

[Effective from Session 20016-17]

YEAR IV, SEMESTER-VII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-071 to 074	Open Elective -I	3	1	0	30	20	50	100	150	4
2	NME-701	CAD	3	1	0	30	20	50	100	150	4
3	NME-702	Automobile Engineering	3	1	0	30	20	50	100	150	4
4	NME-031 to NME-034	Departmental Elective – III	3	1	0	30	20	50	100	150	4
5	NME-041 to NME-044	Departmental Elective – IV	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-751	CAD/CAM Lab	0	0	2	10	10	20	30	50	1
6	NME-752	I. C. Engine and Automobile Lab.	0	0	2	10	10	20	30	50	1
7	NME-753	INDUSTRIAL TRG.	0	0	2	-	50	50	-	50	1
8	NME-754	PROJECT	0	0	3	-	50	50	-	50	2
	GP-701	GP	-	-	-	-	-	50	-	50	-
		TOTAL	15	5	9					1000	25

Note- Practical Training-1 & 2 (4-weeks each) done after 4^{th} & 6^{th} Semesters would be evaluated in 7^{th} semester through report and viva voce etc.
Project should be initiated in 7^{th} semester beginning **(End Semester Examination to be conducted for evaluation for 7^{th} sem),** and should be complete by the end of 8^{th} semester with good Report and power-point Presentation etc.

<u>Open Electives – I</u>

- NOE-071 Entrepreneurship Development
- NOE-072 Quality Management
- NOE-073 Operations Research
- NOE-074 Introduction to Biotechnology

<u>Departmental Elective III</u>

- NME-031 Computer Aided Manufacturing
- NME-032 Project Management
- NME-033 Computational Fluid Dynamics
- NME-034 Composite materials

<u>Departmental Elective IV</u>

- NME-041 Total Quality Management
- NME-042 Thermal Turbo Machines
- NME-043 Mechanical System Design
- NME-044 Automation and Robotics

U.P. TECHNICAL UNIVERSITY, LUCKNOW

STUDY & EVALUATION SCHEME

B. Tech. Production Engineering / Industrial & Production Engineering / Mechanical & Industrial Engineering
[Effective from Session 20016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NPI-801	Quality Control	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective –V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing

U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Mechanical Engineering
[Effective from Session 2016-17]

YEAR IV, SEMESTER-VIII

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Assessment			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	NOE-081 to 084	Open Elective -II	3	1	0	30	20	50	100	150	4
2	NME-801	Power Plant Engineering	3	1	0	30	20	50	100	150	4
3	NME-051 to NME-055	Departmental Elective -V	3	1	0	30	20	50	100	150	4
4	NME-061 to NME-065	Departmental Elective -VI	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NME-851	SEMINAR	0	0	3	-	50	50	-	50	2
6	NME-852	PROJECT	0	0	12	-	100	100	200	300	7
7	GP-801	GP	-	-	-	-	-	50	-	50	-
		TOTAL	12	4	15					1000	25

Open Electives – II

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic Systems
NOE-083 Product Development
NOE-084 Automation and Robotics

Departmental Elective V

NME-051 Operations Research
NME-052 Design of Thermal Systems
NME-053 Advance Synthesis of machines
NME-054 Industrial Automation
NME-055 Advance Welding Technology

Departmental Elective VI

NME-061 Experimental Stress Analysis
NME-062 Plant Layout and Material Handling
NME-063 Additive Manufacturing
NME-064 Computer Aided Process Planning
NME-065 Non Destructive Testing.

NME-701: COMPUTER AIDED DESIGN (CAD) **L T P**
3 1 0

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications Computer Graphics-I CAD/CAM systems,

Computer Graphics-I Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Color CRT monitors, Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

8

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3 D transformations, multiple transformation .

8

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

8

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models. Basic application commands for 2d drafting software like AutoCAD/Draftsight (any one)&3d solid modeling software Solidworks/Autodesk Inventor/PTC Creo /Catia (Any one)etc.

8

UNIT-V

Finite Element Analysis: Basic concept of the finite element method, comparison of FEM with direct analytical solutions; Steps in finite element analysis of physical systems, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation by direct approach; development of elemental stiffness equations and their assembly, solution and its post processing.

8

Books and References:

1. Computer Graphics, by Hearn & Baker, Prentice Hall of India

2. CAD/CAM, by Groover and Zimmers, Prentice Hall India Ltd.
3. CAD/CAM :Theory and Practice, by Zeid, McGraw Hill
4. CAD/CAM: Computer Aided Design and Manufacturing, by Groover, Pearson India
5. Mathematical Elements for Computer Graphics, buy Rogers and Adams, McGraw Hill
6. Finite Element Method By S S Rao
7. FE Analysis Theory and Programming, by Krishnamoorthy, Tata McGraw Hill

NME-702: AUTOMOBILE ENGINEERING

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3	1	0

UNIT-I

Introduction:

Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

6

UNIT-II

Transmission System:

Requirements. Clutches. Toque converters. Over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe-in, Toe-out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer.

8

UNIT-III

Braking System:

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects.

5

Chasis and Suspension System:

Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axis suspension system,Air suspension & shock absorbers.

5

UNIT-IV

Electrical System :

Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

5

Fuel Supply System:

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

4

UNIT-V

Emission standards and pollution control :

Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, catalytic converters, fuel additives and modern trends in automotive engine efficiency and emission control.

5

Maintenance system:

Preventive maintenance, break down maintenance and over hauling.

2

Books and References:

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automobile Engineering –TTTI, Pearson India
5. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.
7. Automobile Engineering –Ramakrishna, PHI, India

NME:801 POWER PLANT ENGINEERING

L T P
3 1 0

UNIT-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion calculations.

3

Load estimation, load curves, various terms and factors involved in power plant calculations. Effect of variable load on power plant operation, Selection of power plant units.

2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor.s profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection.

3

UNIT-II

Steam power plant

General layout of steam power plant, Power plant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories, Different systems such as coal handling system, pulverizers and coal burners, combustion system, draft, ash handling system, Dust collection system, Feed water treatment and condenser and cooling towers and cooling ponds, Turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency, Site selection of a steam power plant.

8

UNIT-III

Diesel power plant

General layout, Components of Diesel power plant, Performance of diesel power plant, fuel system, ubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance, Site selection of diesel power plant, Comparative study of diesel power plant with steam power plant.

2

Gas turbine power plant

Layout of gas turbine power plant, Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants, Site selection of gas turbine power plant

6

UNIT-IV

Nuclear power plant

Principles of nuclear energy, Lay out of nuclear power plant, Basic components of nuclear reactions, nuclear power station, Nuclear waste disposal, Site selection of nuclear power plants.

3

Hydro electric station Hydrology, Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems.

4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

2

UNIT-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc.

2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms.

3

Pollution

Pollution due to power generation

2

Books and References:

1. Power Plant Engineering, by F.T. Morse, Affiliated East-West Press Pvt. Ltd
2. Power Plant Engineering by Hedge, Pearson India
3. Power Plant Technology, by Wakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.
6. Power Plant Engineering by Gupta, PHI India
7. Power Plant Engineering. Mahesh Verma, Metropolitan Book Company Pvt. Ltd.

NPI- 801 : **QUALITY CONTROL** **L T P**
3 1 0

UNIT-I

Introduction : Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability.

3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation.

5

UNIT-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

8

UNIT-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

7

UNIT-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System.

3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure.
MTBF. Maintainability, Condition monitoring and dignostic techniques.

4

Value Engineering : Elements of value analysis, Techniques.

2

Unit-V :

TQM : Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts.

6

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

2

Books and Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

NME-751:CAD/CAM LAB

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Total TEN Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.

3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

NME-752: I.C. ENGINES AND AUTOMOBILE LAB

L T P
0 0 2

Experiments : Say minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.

8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, Cheverlet Aveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

DEPARTMENT ELECTIVE-III

NME-031: COMPUTER AIDED MANUFACTURING (CAM) **L T P**
3 1 0

UNIT-I

Introduction to Automation: Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

8

UNIT-II

Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system.
Definition and designation of control axes, Constructional details of Numerical Control Machine Tools, MCU structure and functions, Methods of improving accuracy and productivity using NC.

8

UNIT -III

Computer Numerical Control (CNC) : Features of CNC, Elements of CNC machines, the machine control unit for CNC , Direct Numerical Control(DNC) and Adaptive Controls.
System Devices: Drives, Feedback devices, Counting devices, DAC and ADCs, Interpolator systems, Control loop circuit elements in PTP system, Contouring system, Incremental and absolute systems.

8

UNIT -IV

NC Part Programming- (a) Manual (word address format) programming Examples Drilling, Turning and Milling; canned cycles, Subroutine, and Macro.
(b) Computer Assisted Part programming (APT) Geometry, Motion and Additional statements, Macro- statement.

8

UNIT-V

Computer Integrated manufacturing system , Group Technology, Flexible Manufacturing System, Computer aided process planning-Retrieval and Generative System. Types and generations of Robots, Structure and operation of Robot, Robot applications.

8

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.
6. CAD/CAM: Concepts and Applications by Alavala, PHI India
7. Computer Aided Manufacturing, by Srinivas, Oxford University Press.

NME-032: PROJECT MANAGEMENT **L T P**
3 1 0

UNIT-I
Project Management Concepts
Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction.

8

UNIT-II
Project Organization & Project Contracts
Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors.

8

UNIT-III
Project Appraisal & Cost Estimation
Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis.

8

UNIT-IV
Project Planning & Scheduling
Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique.

8

UNIT-V
Modification & Extensions of Network Models
Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution. Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management-

essential requirements of PM software, software packages for CPM. Enterprise- wide PM, using spread sheets for financial projections.

8

Books and References :

1. Project Management by Harvey Maylor, Pearson India
2. Project Management by Choudhury, McGraw Hill
3. Project Management by K. Nagarajan
4. Project Management: A Systems Approach to Planning, Scheduling and Controlling, by Kerzner, Willey
5. Project Management: A Life Cycle Approach by Kanda, PHI, India
6. Project Management and Appraisal, byKhatua, Oxford University Press.

NME-033: COMPUTATIONAL FLUID DYNAMICS

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3	1	0

UNIT- I

GOVERNING EQUATIONS AND BOUNDARY CONDITIONS:

Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averagedequations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behavior of PDEs onCFD. Elliptic, Parabolic and Hyperbolic equations.

8

UNIT -II

FINITE DIFFERENCE METHOD:

Derivation of finite difference equations. Simple Methods. General Methods for first and second orderaccuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations . Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

9

UNIT- III

FINITE VOLUME METHOD (FVM) FOR DIFFUSION:

Finite volume formulation for steady state One, Two and Three dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

9

UNIT -IV

FINITE VOLUME METHOD FOR CONVECTION DIFFUSION:

Steady one-dimensional convection and diffusion. Central, upwind differencing schemes-properties ofdiscretization schemes. Conservativeness, Boundedness, Trasnportiveness, Hybrid, Power-law, QUICKSchemes.

10

UNIT- V

CALCULATION FLOW FIELD BY FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and itsvariants. Turbulence models, mixing length model, Two equation (k-€) models. High and low Reynoldsnumber models

9

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis .
3. Computational Heat Transfer, by Jaluria ans Torrance, CRC Press
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.
9. Computational Fluid Dynamics: Principles and Applications, by Blazek, Elsevier Science & Technology.

NME-034: COMPOSITE MATERIALS

L	T	P
3	1	0

UNIT-1

Introduction: Classifications of Engineering Materials, Concept of composite materials, Matrix materials, Functions of a Matrix, Desired Properties of a Matrix, Polymer Matrix (Thermosets and Thermoplastics), Metal matrix, Ceramic matrix, Carbon Matrix, Glass Matrix etc.

7

UNIT-II

Types of Reinforcements/Fibers: Role and Selection of reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc., Mechanical properties of fibres. Material properties that can be improved by forming a composite material and its engineering potential.

7

UNIT-III

Various types of composites: Classification based on Matrix Material: Organic Matrix composites, Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC); Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, Comparison with Metals, Advantages & limitations of Composites.

10

UNIT-IV

Fabrication methods: Processing of Composite Materials: Overall considerations, Autoclave curing, Other Manufacturing Processes like filament welding, compression molding, resin-transplant method, pltrusion, pre-peg layer, Fiber-only performs, Combined Fiber-Matrix performs, Manufacturing Techniques: Tooling and Specialty materials, Release agents, Peel plies, release films and fabrics, Bleeder and breather plies, bagging films.

10

UNIT-V

Testing of Composites: Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.

6

Books and References :

1. Materials characterization, Vol. 10, ASM hand book
2. Mechanical Metallurgy, by G. Dieter, McGraw Hill
3. Analysis and Performance of Fiber Composites, by Agarwal, McGraw Hill
4. Thermal Analysis of Materials, by R.F. Speyer, Marcel Decker
5. Engineering Mechanics and Composite Materials , by Daniels, Oxford University Press.
6. Engineering Materials: Polymers, Ceramics and Composites, by A.K Bhargava Prentice Hall India
7. Material Science and Engineering (SIE) with CD, by Smith, McGraw Hill

DEPARTMENT ELECTIVE-IV

NME-041: TOTAL QUALITY MANAGEMENT (TQM) **L T P**
3 1 0

UNIT -I

Quality Concepts

Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

4

Control on Purchased Product

Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

4

Manufacturing Quality

Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

3

UNIT -II

Quality Management

Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

5

Human Factor in Quality

Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

3

UNIT -III

Tools and Techniques

Seven QC tools (Histogram, Check sheet, Ishikawa diagram, Pareto, Scatter diagram, Control chart, flow chart).

3

Control Charts

Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

3

Attributes of Control Charts

Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

3

UNIT -IV

Defects Diagnosis and Prevention

Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

6

UNIT -V

IS0-9000 and its concept of Quality Management

ISO 9000 & ISO 14000 series, Quality information system and documentation, Auditing, Taguchi method, JIT in some details.

6

Books and References:

1. Total Quality Management, by Dale H. Besterfield, Pearson India
2. Beyond Total Quality Management, Greg Bounds, McGraw Hill.
3. TQM in New Product manufacturing, H. G. Menon, McGraw Hill.
4. Total Quality Management, by Suri, Wiley.
5. Total Quality Management, by Subburaj, McGraw Hill.
6. Total Quality Management, by Poornima Chantimath, Pearson India
7. Quality Management by Bedi, Oxford University Press.
8. Total Quality Management-Text and Cases, by Janakiraman & Gopal, PHI, India.
9. Total Quality Management, H. Lal, Eastern Limited.
10. Total Quality Management, A. Arivalagar , R. S. Naagarazan, New Age International.

NME-042: THERMAL TURBOMACHINES **L T P**
3 1 0

UNIT-I

Brief history of turbo machinery, introduction to blowers, pumps, compressors, steam &gas turbines, turbojet, Review of laws of thermodynamics & SFEE in reference to turbomachinery, Energy transfer in turbo machines, Euler's equation, Definition of variousefficiencies, Preheat factor, Reheat factor, Blade classification, Blade terminology,Cascade testing, Velocity diagrams for axial and radial turbomachinery and pumps.

8

UNIT-II

Centrifugal compressors- Principle of operation, work done and pressure rise, Velcoitydiagram for centrifugal compressor, Slip factor, Stage pressure rise, Loading coefficient,Diffuser, degree of reaction, Effect of impeller blade profile, Pre-whirl and inlet guidevanes, Centrifugal Compressor characteristic curves.

4

Axial flow compressor- Principle of operation and working, Energy transfer, Velocitydiagram for axial compressor, Factors affecting stage pressure ratio, Blockage incompressor annulus, Degree of reaction, 3-D flow, Design process, blade design,calculation of stage performance, Axial compressor performance characteristic curves.

4

UNIT-III

Axial flow turbines-Elementary theory of axial flow turbine, Energy transfer, Velocitydiagram, Types of blades, Vortex theory, Choice of blade profile, pitch and chord,Estimation of stage performance, Characteristic curves.

4

UNIT-IV

Steam turbines- Constructional details, working of steam turbine.

4

Pumps : Classification of Pumps, Main components, indicator diagram and modificationdue to piston acceleration, Performance characteristics, Cavitation and its control,Miscellaneous types of pumps.

4

Radial flow turbines: Elementary theory of radial flow turbines, Enthalpy- Entropydiagram, State losses, Estimation of stage performance, Performance characteristics.

4

UNIT-V

Gas Turbine Starting & Control Systems: Starting ignition system, Combustionsystem types, Safety limits & control.

Turbine Blade coding: Different cooling techniques, Types of coolants, Comparativeevaluation of different cooling techniques.

Mechanical Design consideration: Overall design choices, Material selection, Designwith traditional materials.

8

Books and References:

1. Gas turbine theory : Cohen & Rogers, Addison Weslay Longman Ltd.
2. Fundamentals of Turbomachinery by Venkanna, PHI, India
3. Turbine, Compressors and Fans, S.M. Yahya, Tata Mc Graw Hill.

4. Gas Turbine- Ganeshan, Tata Mc Graw Hill.
5. Thermal Turbomachines, by Singh, Wiley
6. Fundamentals of Turbomachinery, by Venkanna, PHI, India.

NME – 043: MECHANICAL SYSTEM DESIGN **L T P**
3 1 0

UNIT-I
Engineering process and System Approach
Basic concepts of systems, Attributes characterizing a system, types of system, Application of system concepts, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.
4

Problem Formulation : Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.
4

UNIT-II
System Theories: Introduction, System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system.
4

System modeling
Introduction, Model types and purpose, linear systems, mathematical modeling, concepts, A case study compound bar system.
4

UNIT-III
Graph Modeling and Analysis
Graph Modeling and analysis process, path problem, Network flow problem, A case study: Material handling system.
4

Optimization Concepts
Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.
4

UNIT-IV
System Evaluation
Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system.
4

Calculus Method for Optimization
Model with single decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

4

UNIT-V

Decision Analysis

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict probability, density function, Expected monetary value, Utility value, Baye's theorem, A case study: Installation of machinery.

4

System Simulation

Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

5

Books and References:

1. Design and Planning of Engineering systems-DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. Engineering Design, by Dieter, McGraw Hill
3. Design Engineering-JR Dixon, TMH, New Delhi
4. An Introduction to Engineering Design Method-V Gupta and PN Murthy, TMH, New Delhi
5. Engineering Design-Robert Matousck, Blackie and son ltd. Glasgow
6. Optimization Techniques-SS Rao
7. System Analysis and Project Management-Devid I Cleland, William R King, McGraw Hill.

NME-044: AUTOMATION AND ROBOTICS **L T P**
3 1 0

UNIT- I

AUTOMATION:

Definition, Advantages, goals, types, need, laws and principles of Automation. Elements of Automation.

Fluid power and its elements, application of fluid power, Pneumatics vs. Hydraulics, benefit and limitations of pneumatics and hydraulics systems, Role of Robotics in Industrial Automation.

7

UNIT- II

Manufacturing Automation:

Classification and type of automatic transfer machines; Automation in part handling and feeding, Analysis of automated flow lines, design of single model, multimodel and mixed model production lines. Programmable Manufacturing Automation CNC machine tools, Machining centers, Programmable robots, Robot time estimation in manufacturing operations.

7

UNIT- III

ROBOTICS

Definition, Classification of Robots - Geometric classification and Control classification, Laws of Robotics, Robot Components, Coordinate Systems, Power Source.

Robot anatomy, configuration of robots, joint notation schemes, work volume, manipulator kinematics, position representation, forward and reverse transformations, homogeneous transformations in robot kinematics, D-H notations, kinematics equations, introduction to robot arm dynamics.

9

UNIT -IV

ROBOT DRIVES AND POWER TRANSMISSION SYSTEMS

Robot drive mechanisms: Hydraulic / Electric / Pneumatics, servo & stepper motor drives, Mechanical transmission method: Gear transmission, Belt drives, Rollers, chains, Links, Linear-to-Rotary motion conversion, Rotary-to-Linear motion conversion, Rack and Pinion drives, Lead screws, Ball Bearings.

ROBOT END EFFECTORS

Classification of End effectors – active and passive grippers, Tools as end effectors, Drive system for grippers. Mechanical, vacuum and magnetic grippers. Gripper force analysis and gripper design.

9

UNIT- V

ROBOT SIMULATION

Methods of robot programming, Simulation concept, Off-line programming, advantages of off-line programming.

ROBOT APPLICATIONS

Robot applications in manufacturing-Material transfer and machine loading/unloading, Processing operations like Welding & painting, Assembly operations, Inspection automation, Limitation of usage of robots in processing operation.

Robot cell design and control, Robot cell layouts-Multiple robots & Machine interference.

8

Books and Reference :

1. An Introduction to Robot Technology, by Coifet Chirroza, Kogan Page.
2. Robotics for Engineers, by Y. Koren, McGraw Hill.
3. Robotic: Control, Sensing, Vision and Intelligence, by Fu, McGraw Hill.
4. Introduction to Industrial Robotics, by Nagrajan, Pearson India
5. Robotics , by J.J. Craig, Addison-Wesley.
6. Industrial Robots , by Groover, McGraw Hill.
7. Robots & Manufacturing Automation, by Asfahl, Wiley
8. Fundamentals of Robotics: Analysis and Control, by Schilling, Pearson India
9. Automation & Robotics, byGhoshal, Oxford University Press.
10. Introduction to AI Robotics, by Murphy, PHI, India.

DEPARTMENT ELECTIVE-V

NME-051: OPERATIONS RESEARCH **L T P**

3 1 0

UNIT-I

Introduction: Basic of Operation Research, Origin & development of Operation Research,Applications.

2

Linear Programming: Introduction & Scope, Problem formulation, Graphical Method, Simplex methods, primal and dual problem sensitivity analysis.

7

UNIT-II

Transportation Problem: Methods of obtaining initial and optimum solution, degeneracy in transportation problems, unbalanced Transportation Problem.

4

Assignment Problem: Methods of obtaining optimum solution, Maximization problem, travelling salesman problem.

3

UNIT-III

Game Theory: two person Zero sum game, Solution with/without saddle point, dominance rule, Different methods like Algebraic, Graphical and game problem as a special case of Linear Programming.

4

Sequencing: Basic assumptions, n Jobs through 2-3 machines, 2 Jobs on m machines.

3

UNIT-IV

Stochastic inventory models: Single & multi period models with continuous & discrete demands, Service level & reorder policy.

4

Simulation: Use, advantages & limitations, Monte-carlo simulation, Application to queuing, inventory & other problems.

4

UNIT-V

Queuing models: Characteristics of Queuing Model, M/M/1 and M/M/S system, cost consideration.

3

Project management: Basic Concept of network Scheduling, Rules for drawing network diagram, Applications of CPM and PERT techniques in Project planning and control; crashing of operations; resource allocation.

6

Books and References:

1. Operations Research: Principles and Practice, by- Ravindran, Phillips, Solberg, John Wiley & Sons.
2. Principal of Operation Research, by- Harvey M. Wagner, Prentice Hall.
3. Introduction to Operation Research, by- Gillett, McGraw Hill.
4. Operations Research - An Introduction, by- Hamdy A. Taha, Pearson India.
5. Operation Research, by- Wayne L. Winston, Thomsan Learning.
6. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand.
7. Operation Research Application and Algorithms, by- Wayne L Winston, Duxbury Press.
8. Operations Research, by Jha, McGraw Hill.
9. Operation Research, by Yadav & Malik Oxford University Press
10. Operations Research, by Panneerselvam, PHI, India

NME-052 : DESIGN OF THERMAL SYSTEMS **L:T:P**
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Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychrometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, Inside & out side design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

5

Design & Selection of Air conditioning Apparatus **:**Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

3

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation. Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

8

Unit-III

Turbomachines:Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

8

Unit-IV

Design of Heat Exchanger :Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

8

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

8

Books and References:

1. Thermal Environment Engg. by Kuhen, Ramsey & Thelked.
2. Refrigeration & Air Conditioning - By C.P. Arora, McGraw Hill
3. Refrigeration & Air Conditioning - By Manohar Prasad, New Age
4. Heating, Ventilating and Air Conditioning - By Mc Quistion, Parker & Spitler
5. Refrigeration & Air Conditioning Data Book – Manohar Prasad, New Age
6. ASHRAE Hand Book of Fundamentals-ASHRAE
7. Refrigeration & Air Conditioning-Stoecker & Jones, Mc Graw Hill
8. Design of High Efficiency Turbomachinery and Gas Turbine by Wilsonm and Korakianitis, PHI, India
9. Turbines compressors and Fans by Yahaya, Mc Graw Hill
10. Heat Transfer Equipment Design by Shah, CRC Press
11. Thermal System Design and Optimization by Balaji, Ane Books Pvt Ltd

NME-053: ADVANCE SYNTHESIS OF MECHANISMS

L T P
3 1 0

UNIT-I

Introduction:

Mechanisms: Classifications, Relative and absolute motion, degree of freedom, 4-barMechanisms, planar and spatial mechanisms, Inversion and equivalent linkage,Transmission angle.

4

Kinematic analysis of Planer motion: Relative velocity, Instantaneous centre, Poles and centrodes, Relative acceleration.

4

UNIT-II

Kinematic Synthesis: Type, number and dimensional synthesis, spacing of accuracy points, Chebyshev polynomials.

4

Four bar linkage, Equation of coupler curves, Double points and symmetry, RobertChebyshev theorem, Approximate and exact straight line mechanisms .

4

UNIT-III

Graphical Synthesis of Mechanisms:

Poles and relative poles of four bar linkage, Poles and relative poles of slider crankMechanism. Synthesis of four bar mechanisms.

8

UNIT IV

Analytical Synthesis:

Displacement equation of four bar linkage, Crank and follower synthesis with threeaccuracy points, Four bar function generator with three accuracy points, Crank andfollower synthesis, angular velocities and accelerations

8

UNIT-V

Analytical Synthesis:

Synthesis of slider crank mechanism with three accuracy points, Synthesis of slidercrank mechanism with four accuracy points, cam and follower mechanism, Analysis of mechanical errors in linkage.

8

Books and References:

1. Kinematic Synthesis of Linkages RS Hartenberg and J Denavit McGraw Hill, New York
2. Kinematic and Linkage Design AS Hall Jr Prentice Hall India Ltd.
3. Mechanism and Machine Theory Amitabh Ghosh and AK Mallick
4. Mechanism Design: Analysis &Synthesis Erdman & Sandor Prentice Hall of India
5. Kinematics and Dynamics of machinery (SIE), by Norton, McGraw Hill

NME-054: INDUSTRIAL AUTOMATION –I

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Unit-I:

Historical perspective of Industrial Automation

- Origin, Evolution and Need / Demand of automation in industries, Current and future Trends
- Components of Industrial Automation System and their functionalities, Layers and Types of Automation

6

Unit -II:

Automation Controllers

- Introduction of Industrial Controllers
- Programmable Logic Controller: Constructions, Types, Programming Units, Memory, I/O Modules.
- Programming methodology
- Ladder Logic programming for Industrial Applications, Timers and Counters
- Selection criteria of PLC
- Examples of PLC application

10

Unit-III:

Industrial Switching Elements

- Electronic Logic gates
- Relays, Solenoids
- Pneumatic Valves and Actuators
- Hydraulic valves and Actuators
- Interfacing: Control of Hydraulics and Pneumatics with Electric Signals
- Comparison between different switching elements

10

Unit-IV:

Visualization: Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA) Systems:

- Need for HMI
- Hardware based HMI panels
- PC based HMI Systems – SCADA
- Different Functionalities
- Benefits of implementing SCADA systems
- Case Studies of SCADA implementation.

10

Unit V:

Case Study

- Hydraulic / Pneumatic Press
- Material handling System
- Machine Tool: NC/CNC Machine

4

Books and References :

1. Programmable Logic Controllers with Control Logix, by Jon Stenerson, Delmar Publishers, 2009.
2. Hand book of industrial Automation, by Richard L Shell and Ernest L Hall, Marcel Dekker Inc., 2000.
3. Practical SCADA for Industry, by David Bailey and Edwin Wright, Newness Publishers, 2003.
4. Automation network Selection, by Dick Caro, ISA – The Instrumentation Systems and Automation Society, 2004.
5. Getting Factory Automation Right (the first time), by Edwin H Zimmerman, Manufacturing Engineers, 2001.
6. Automation, Production Systems and Computer Integrated Manufacturing, by Groover, Pearson India.
7. Industrial Instrumentation and Control, by Singh, McGraw Hill.

NME-055: ADVANCED WELDING TECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Welding as compared with other fabrication processes,Importance and application of welding, classification of welding processes, Health & safety measures in welding.

3

Welding Power Sources: Physics of welding Arc**,** Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

3

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

4

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

3

UNIT-II

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electrogas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

11

UNIT-III

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

5

UNIT-IV

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metallizing processes and Reclamation welding.

2

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, Cast Iron and aluminium. Micro & Macro structures in welding.

4

UNIT-V

Weld Design : Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

5

Books and References:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principals and Practices, by- Edwars R. Bohnart, McGraw Hill Education.
3. Welding Engineering and Technology, by- R. S. Parmar, Khanna Publishsers.
4. Welding Handbooks (Vol. I & II).

DEPARTMENT ELECTIVE-VI

NME- 061: EXPERIMENTAL STRESS ANALYSIS **L T P**
3 1 0

UNIT -I

Stress: Introduction, Two-Dimensional State of Stress, Equations of Equilibrium, Stress Transformation relations, principal Stresses, Special States of Stress.

4

Strain: Introduction, Displacement and Strain, Strain Transformation relations, principal strains, Stress Strain Relations, for Two-Dimensional State of Stress.

4

UNIT- II

Strain Measurements: Introduction, Properties of Strain Gage Systems, Types of Strain Gages, Grid- Method of Strain Analysis.

4

Brittle Coating Method: Introduction, Coating Stresses, Brittle Coating Crack Patterns, Resin and Ceramic Based Brittle Coating, Test Procedure, Analysis of Brittle Coating Data.

4

UNIT -III

Electrical Resistance Strain Gages: Introduction, Strain Sensitivity in Alloys, Strain Gage Adhesives, Gage Sensitivity and Gage Factor.

4

Strain Gage Circuit: Potentiometer, Wheat-Stone Bridge, Bridge Sensitivity, Null Balance Bridges.Three Element Rectangular Rosette

4

UNIT- IV

Theory of Photoelasticity: Introduction, Temporary Double Refraction, Stress Optic Law, Relative Retardation, Stressed Model in Plane Polariscope, Stressed Model in Circular Polariscope.

8

UNIT -V

Two Dimensional Photoelasticity : Introduction, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, Compensation Techniques, Calibration Methods, Separation Methods, Shear Difference Method, Electrical Analogy Method, Oblique Incidence Method.

8

Books and References :

1. Experimental Stress Analysis, by U C Jindal, Pearson India
2. Experiment Stress Analysis, by James W. Dally and William F. Riley, McGraw-Hill International
3. Experiment Stress Analysis by Dr. Sadhu Singh, Khanna Publishers.
4. Advance Strength and Applied Stress Analysis, by Budynas, McGraw-Hill

NME- 062: PLANT LAYOUT AND MATERIAL HANDELING

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310

UNIT -I

Introduction

Criteria, Strategies/Tactics, Sustainability and Eco-Efficiency in Facility Design, Basic Planning, Alternative Machine Arrangements, Flow Lines, Location Models, Act/Building Details, Aisles and Security, Storage, Shipping and Receiving, Offices, Specialized Areas.

8

UNIT -II

Workstations, Unit Loads & Containers, Conveyors, Vehicles, Lifting Devices, Workstation Material Handling, Ethics in Facility Design

Facilities design procedure and planning strategies, Production, activity and materials flow analysis, Space requirements and personnel services design considerations.

8

UNIT -III

Layout construction techniques: systematic layout planning; activity relationship analysis, pair wise exchange, graph-based construction algorithmic.

Material Handling: Material handling principles; material handling equipment and material handling systems.

8

UNIT -IV

Computerized Layout and Analytical Methods: ALDEP, CORELAP, CRAFT, BLOCPLAN, etc. **Warehouse operations**: function, storage operations.

Manufacturing operation: JIT, TQM, AM, CIM, SCM, Facility systems,

Quantitative models: Layout model, waiting line, AS/RS, simulation model, etc.

8

UNIT -V

Assessment and evaluation of layout alternatives Projects, Use Spiral software to practice plant layout design, Apply mathematical and engineering techniques such as systematic layout planning approach, quantitative model, cost estimate to solve practical facility layout problem.

8

Books and References:

1. Plant Layout and Material Handling, by- James M. Apple, John Wiley & Sons.
2. Plant Layout and Material Handling, by- Fred E. Meyers, Prentice Hall.
3. Facility Layout and Location: An Analytical Approach, by Richard L, Francis, Pearson India.
4. Plant Layout and Material Handling, by- B. K. Aggarwal, Jain Brothers.
5. Plant Layout and Material Handling, by- S. C. Sharma, Jain Brothers.
6. Materials Handling Handbook, by- Raymond A. Kulwiec, John Wiley & Sons.
7. Plant Design and Economics, by- Peters, McGraw Hill Education.
8. Purchasing and Material Management, by- Gopalakrishnan, McGraw Hill Education.

NME-063: ADDITIVE MANUFACTURING

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UNIT-I

Introduction

History and Advantages of Additive Manufacturing, Distinction Between Additive Manufacturing and CNC Machining, Types of Additive Manufacturing Technologies, Nomenclature of AM Machines, **Direct and Indirect Processes;** Prototyping, Manufacturing and Tooling.

4

Layer Manufacturing Processes; Polymerization, Sintering and Melting, Extrusion, Powder-Binder Bonding, Layer Laminate Manufacturing, Other Processes; Aerosolprinting and Bioplotter.

4

UNIT-II

Development of Additive Manufacturing Technology

Computer Aided Design Technology, Other Associated Technology, Metal and Hybrid Systems.

3

Generalized Additive Manufacturing Process Chain; The Eight Steps in Additive Manufacturing, Variation from one AM Machine to Another, Metal System, Maintenance of Equipment, Material Handling Issue, Design of AM.

5

UNIT-III

Additive Manufacturing Processes

Vat Photopolymerization; Materials, Reaction Rates, Photopolymerization Process Modeling, Scan Patterns, **Powder Bed Fusion Processes;** Material, Powder Fusion Mechanism, Process Parameters and Modeling, powder Handling, **Extrusion Based System;** Basic principles, plotting and Path Control, Bioextrusion, Other Systems, **Material Jetting;** Materials, Material Processing Fundamentals, Material Jetting Machines, **Binder Jetting;** Materials, Process Variations, BJ Machines, **Sheet lamination Processes;** Materials, Ultrosonic Additive Manufacturing, **Directed Energy Deposition Processes;** General DED Process Description, Material Delivery, DED systems, Process Parameters, Processiong-Structure-Properties Relationships, **Direct Write Technologies;** Ink-Based DW, laser Transfer DW, Thermal Spray DW, Beam Deposition DW, Liquid Phase Direct Deposition, Hybrid Technologies.

8

UNIT-IV

Design & Software Issues

Additive Manufacturing Design and Strategies; Potentials and Resulting Perspectives, AM based New Strategies, Material Design and Quality Aspects for Additive Manufacturing; Material for AM, Engineering Design Rules for AM.

4

Software Issue for Additive Manufacturing; Introduction, Preperation of CAD Models: The STL file, Problem with STL file, STL file Manupulation, Beyond the STL file, Additional Software to Assist AM.

4

UNIT-V

Material Design & Quality Aspects

Machines for Additive Manufacturing, Printers, Secondary Rapid Prototyping processes, Intellectual Property, Product Development, Commercialization, Trends and Future Directions in Additive Manufacturing, Business Opportunities

4

Applications

Aerospace, Automotive, Manufacturing, Architectural Engineering, Art, Jewelry, Toys, Medical, Biomedical, Dental, Bio-printing, Tissue & Organ Engineering and many others.

4

Books and References:

1. Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, by- Ian Gibson , DSavid W. Rosen , Brent Stucker, Springer.
2. Understanding Additive Manufacturing, by- Andreas Gebhardt, Hanser.
3. Additive Manufacturing, by- Amit Bandyopadhyay, Susmita Bose, CRC Press.
4. Rapid Prototyping: Principles and Applications, by - Chee Kai Chua, Kah Fai Leong, Chu Sing Lim.

NME-064: COMPUTER AIDED PROCESS PLANNING

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3 1 0

UNIT-I

Introduction to CAPP: Principles, scope and information requirement for CAPP, Role of process planning, Manual and experienced based process planning, Advantages of CAPP over conventional process planning, Decision table and decision trees, process capability analysis, Tolerance analysis, Variant process planning, Generative approach, Forward and Backward planning.

8

UNIT-II

Computer Aided Process Planning: Logical design of process planning systems, Implementation considerations, Computer based process monitoring and control, Computer and process interfacing, Totally integrated process planning systems, Process planning for rotational and prismatic parts, Machining of curves and surfaces, Five axis machining, Process planning of freedom surfaces, Development of NC codes, Computer aided design of fixtures, Inspection policies and inspection planning, Expert systems and their use in developing process planning systems.

8

UNIT-III

Retrieval CAPP system: Significance, group technology, structure, relative advantages, implementation, and applications. Selection of manufacturing sequence: Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples. Generative CAPP system: importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

8

UNIT-IV

Determination of machining parameters: Reasons for optimal selection of machining parameters, effect of parameters on production, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes, design and manufacturing tolerances, methods of tolerance allocation, sequential approach, integration of design and manufacturing tolerances.

8

UNIT-V

Generation of tool path: Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods. Implementation techniques for CAPP: MIPLAN system, Computer programming languages tbr CAPP, criteria for selecting a CAPP system and benefits of CAPP. Computer integrated planning systems, and Capacity planning system.

8

Books and References:

1. Production Systems and Computer Integrated Manufacturing System, by- Mikell P Groover, Prentice Hall.
2. Computer Processing of Remotely Sensed Images: An Introduction, 3rd Edition, by- Mather Paul, Wiley.
3. Computer Aided Process Control, by- SK Singh, PHI Learning Pvt. Ltd.
4. Computer Aided Design and Manufacturing, by- M. Sarcar, K. L. Narayan, PHI Learning Pvt. Ltd.

NME-065: NON-DESTRUCTIVE TESTING **L T P**
3 1 0

Unit-I

Introduction

Scope and advantages of NDT, Comparison of NDT with Destructive Testing, Some common NDT methods used since ages, Terminology, Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test, chalk test (oil whitening test). Uses of visual inspection tests in detecting surface defects and their interpretation, advantages & limitations of visual inspection.

6

Unit-II

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrants and developers, Zyglo test, Illustrative examples and interpretation of defects.

5

Magnetic particle Inspection – scope and working principle, Ferro Magnetic and Non-ferromagnetic materials, equipment & testing. Advantages, limitations Interpretation of results, DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

5

Unit-III

Radiographic methods

Introduction to electromagnetic waves and radioactivity, various decays, Attenuation of electromagnetic radiations, Photo electric effect, Rayleigh’s scattering (coherent scattering), Compton’s scattering (Incoherent scattering), Pair production, Beam geometry and Scattering factor.

X-ray radiography: principle, equipment & methodology, applications, types of radiations and limitations. γ-ray radiography – principle, equipment., source of radioactive materials & technique, advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study - casting and forging.

8

Unit-IV

Ultrasonic testing methods

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study – Ultrasonography of human body.

8

Unit-V

Special NDT Techniques

Eddy Current Inspection: Principle, Methods, Equipment for ECT, Techniques, Sensitivity, advanced ECT methods. Application, scope and limitations, types of Probes and Case Studies. Introduction to Holography, Thermography and Acoustic emission Testing.

8

Books and References:

1. Non-Destructive Testing and Evaluation of Materials, by- Prasad, McGraw Hill Education.
2. Basics of Non-Destructive Testing, by Lari & Kumar, KATSON Books.
3. Practical Non-destructive Testing, by- Baldev Raj, T. Jayakumar, M. Thavasimuthu, Woodhead Publishing.
4. Non-Destructive Testing Techniques, by- Ravi Prakash, New Age International.
5. Nondestructive Testing Handbook,by Robert C. McMaster, American Society for Nondestructive.
6. Introduction to Nondestructive Testing: A Training Guide, by- Paul E. Mix, wiley.
7. Electrical and Magnetic Methods of Non-destructive Testing, by- J. Blitz, springer**.**

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004.

NEC 702 DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, “Computer Networks” Pearson.
5. Ajit Pal, “Data Communication and Computer Networks”, PHI
6. Dimitri Bertsekas, Robert G. Gallager, “Data Networks”, Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins,“ Carrier-Grade VoIP”, McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, “IP Telephony – Deploying Voice Over-IP Protocols”, John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, “Analog Filter Design”, 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,”Applications and Design with Analog Integrated Circuits”, Second edition, Pearson.
2. T. Deliyannis, Yichuang Sun, J.K. Fidler, “Continuous-Time Active Filter Design”, CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.
   a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper
   b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable
   c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector
   d) Crimping of RJ45 connector using Crimping tool
   e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)
   f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router
   a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.
   b) Different types of show commands & their purpose.
   c) Assignment of IP address and enabling layer 3 connectivity.
   d) Implement sub netting

3. Configuring web and DHCP servers
   a) Understand Internet Information Services tool and its installation.
   b) To configure web services using IIS tool.
   c) Configure DHCP

4. Configuring VLAN
   a) Understand the configuration of Vlan in a switch
   b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network
   c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752 Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, “Optical Networks a Practical perspective”, Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, “Optical Networks: Third Generation Transport Systems”/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee “Optical WDM Networks” Springer Pub 2006.

ELECTIVE IV

	NEC 041 ELECTRONIC SWITCHING	3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, “Telecommunication Switching Systems and Networks”, PHI.

2. J.E. Flood, “Telecommunication Switching, Traffic and Networks”, Pearson Education.

3. John C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, “VHDL-Modular Design and Synthesis of cores and Systems”, TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, “Introduction to VHDL” Spriger Publication, 2010.
3. J Bhasker , “VHDL Primer” –Pearson Education.

Reference Books:

3. C. H. Roth, “Digital System Design using VHDL”, PWS Publishing
4. Douglas Perry, “VHDL- Programming by examples”, MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, "Digital Processing of speech signals", Pearson Education.
2. B. Gold and Nelson Morgon, "Speech and audio signal processing", Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , “Handbook of Visual Display Technology”, Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik “ Introduction to Radar Systems”, Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen “Principles of Radar”, PHI Learning.
3. B.Pratt, A.Bostian, “Satellite Communications”, Wiley India.
4. D.Roddy, ”Satellite Communications”, TMH.

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-701	ELECTRIC DRIVES	3	1	0	30	20	50	100	150	4
2	NEE-702	POWER STATION PRACTICE	3	1	0	30	20	50	100	150	4
3	NEC-702A	ANALOG & DIGITAL COMMUNICATION	3	1	0	30	20	50	100	150	4
4	NEE-031-033, NCS-039	DEPARTMENTAL ELECTIVE-III	3	1	0	30	20	50	100	150	4
5	NOE-071-NOE-074	OPEN ELECTIVE-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
6	NEE-751	ELECTRIC DRIVE LAB	0	0	3	10	10	20	30	50	1
7	NEC-752B	ADC LAB	0	0	3	10	10	20	30	50	1
8	NEE-753	INDUSTRIAL TRAINING	0	0	2	30	20	50	--	50	1
9	NEE-754	PROJECT	0	0	2	30	20	50	--	50	1
10	NGP-701	GP					50	50	--	50	1
		TOTAL	16	5	10					1000	24

LIST OF DEPARTMENTAL ELECTIVE-III

NEE-031 POWER SYSTEM OPERATION AND CONTROL
NEE-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEE-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I

NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATION RESEARCH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-801	ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS	3	1	0	30	20	50	100	150	4
2	NEE-802	UTILIZATION OF ELECTRICAL ENERGY AND TRACTION	3	1	0	30	20	50	100	150	3
3	NEE-041 - NEE-044	DEPARTMENTAL ELECTIVE-IV	3	1	0	30	20	50	100	150	4
4	NOE-081 - NOE-084	OPEN ELECTIVE-2	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-851	PROJECT	0	0	12	0	100	100	250	350	8
6	NGP-801	GP					50	50	-	50	1
		TOTAL	14	5	12		180	350	650	1000	24

LIST OF DEPARTMENTAL ELECTIVE IV

NEE-041 EHVAC&DC TRANSMISSION
NEE-042 POWER QUALITY
NEE-043 EMBEDDED SYSTEM
NEE-044 SCADA

LIST OF OPEN ELECTIVE 2

NOE-081 NON-CONVENTIONAL ENERGY RESOURCES
NOE-082 NON LINEAR DYNAMIC SYSTEMS
NOE-083 DATA BASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING
NOE-084 AUTOMATION & ROBOTICS

NEE701/NEN 701: Electric Drives

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3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation
Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive
Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors
Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited DC motor drives (continuous conduction only), dual converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited DC motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:
Three Phase induction Motor Drive:
Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
Three Phase Synchronous motor:
Self controlled scheme
Special Drives:
Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:
1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K. Pillai, “A First Course on Electric Drives”, New Age International.
3. B.N. Sarkar, “Fundamental of Industrial Drives”, Prentice Hall of India Ltd.

Reference Books:
1 M. Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V. Subrahmanyam, “Electric Drives: Concepts and Applications”, TataMcGraw Hill.

NEE 702/NEN702: POWER STATION PRACTICE

L T P
3 1 0

UNIT-I:Introduction: Electric energy demand and growth in India, electric energy sources.
Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.
Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.
Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.
Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.
Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V:Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:

1. B.R. Gupta, “Generation of Electrical Energy”, S. Chand Publication.
2. Soni, Gupta & Bhatnagar, “A text book on Power System Engg.”, Dhanpat Rai & Co.
3. P.S.R. Murthy, “Operation and control of Power System” BS Publications, Hyderabad.

Reference Books:

4. W. D. Stevenson, “Elements of Power System Analysis”, McGraw Hill.
5. S. L. Uppal, “Electrical Power”, Khanna Publishers.

NEC702A Analog & Digital Communication

UNIT I:

Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:

Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:

Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:

Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin,“ Communication Systems” John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,” Electronic Communication Systems” 4th Edition, Tata McGraw Hill
3. Simon Haykin, “Digital Communications” John Wiley & Sons
4. T.L. Singal, “Analog & Digital Communication”, Tata Mc Graw Hill

Reference Books:

1. B.P. Lathi, “Modern Analog & Digital Communication Systems” Oxford University Press.
2. Taub & Schilling, “Communication System: Analog and Digital” Tata Mc Graw Hill
3. R.P. Singh & S.D. Sapre, “Communication Systems Analog and Digital” Tata McGraw Hill.

NEE –031/NEN-031: POWER SYSTEM OPERATION AND CONTROL

L T P
3 1 0

UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
1. D.P. Kothari & I.J. Nagrath, “Modern Power System Analysis” Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, “Operation and control in Power Systems” B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, “ Understanding FACTs” Concepts and Technology of Flexible AC Transmission Systems”
4. A. J. Wood & B.F. Wollenburg, “ Power Generation, Operation and Control “ John Wiley & Sons.
Reference Books:
1. O.I. Elgerd, “Electric Energy System Theory” Tata McGraw Hill.
2. P. Kundur, “ Power System Stability and Control Mc Graw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza,’ Power System Analysis’ Oxford University Press.

NEE-032/NEN032:
ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

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3 1 0

Unit-I: Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.
16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:
1. Ray, A.K. & Burchandi, K.m., “Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing” Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, “Advanced Microprocessors and Microcontrollers” New Age International.
3. Krishna Kant,”Microprocessors and Microcontrollers” PHI Learning.
4. Brey, Barry B. “The INTEL Microprocessors” Pearson Education.

Reference Books:
1. Ayala, “The 8051 Micro Controller”, Centage Learning.
2. Mazidi M.A., Maizidi J.G. Mckinlay R.D., “The 8051 Microcontroller and Embedded Systems” Pearson Education.
3. Rajkamal, “The concept and feature of microcontrollers 68HC11, 8051 and 8096”, S.Chand Publisher, New Delhi
4. Peatman John, “Design with microcontroller”, Mc.-Graw Hill Publishing.

NEE033/NEN033: FLEXIBLE AC TRANSMISSION SYSTEMS

L T P
3 1 0

UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications
Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications
Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV: Voltage Source Converter Based Facts Controllers
Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability. SSSC-operation of SSSC and the control of power flow – modelling of SSSC in load flow and transient stability studies.

TEXT BOOKS:
1. R.Mohan Mathur, Rajiv K.Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, “Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar,” FACTS Controllers in Power Transmission and Distribution”, New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:
1. A.T. John, “Flexible A.C. Transmission Systems”, Institution of Electrical and Electronic Engineers (IEEE) 1999.
2. V.K. Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, “Flexible AC Transmission System: Modelling and Control” Springer, 2012.

NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

L T P
3 1 0

Unit-I
Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II
Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III
Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV
Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation. Translating object oriented design into implementations.

Unit-V:
Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

Text Books:
1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das "Unix concepts & application" TMH

Reference Books:
1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARCH

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,”Operations Research” Thomson Learning,2003.
2. Hamdy H. Taha, “Operations Research-An Introduction” Pearson Education,2003.
3. R. Panneer Seevam, “Operations Research” PHI Learning, 2008.
4. V.K.Khanna, “Total Quality Management” New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I
Introduction: Concept nature and scope of biotechnology.
Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.
Cell Division: Mitosis and Meiosis.

UNIT-II
Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.
Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication.

UNIT-III
Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.
Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV
Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V
Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:
1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

NEE – 751: ELECTRIC DRIVES LAB

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Note: - Minimum 10 experiments are to be performed from the following out of which at least three should be simulation based.

(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. To study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recovery control scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

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Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.

NEE801: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

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UNIT – I
Crystal Structure of Materials:
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth
B. Energy bands in solids, classification of materials using energy band.

UNIT – II
Conductivity of Metals:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III
Mechanism of Conduction in semiconductor materials:
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV
Magnetic Properties of Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :
1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S. Chand & Co.

References :
1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2 Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
4 T. K. Basak, "Electrical Engineering Materials" New age International.

NEE – 802: UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

L T P
3 1 0

Unit-I:

Electric Heating:

Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

Unit-II:

Electric Welding:

Electric Arc Welding Electric Resistance welding Electronic welding control

Electrolyte Process:

Principles of electro deposition, Laws of electrolysis, applications of electrolysis

Unit-III

Illumination:

Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems

Refrigeration and Air Conditioning:

Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV:

Electric Traction - I

Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V:

Electric Traction – II

Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:

1. H. Partab, "Art and Science of Electrical Energy" Dhanpat Rai & Sons.
2. G.K. Dubey, "Fundamentals of Electric Drives" Narosa Publishing House

Reference Books:

3. H. Partab, " Modern Electric Traction" Dhanpat Rai & Sons.
4. C.L. Wadhwa, " Generation, Distribution and Utilization of Electrical Energy" New Age International Publications.

NEE–041: EHV AC & DC TRANSMISSION

L T P
3 1 0

UNIT-I:Introduction :
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:EHV AC Transmission :
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.
Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters,
Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :
1.R. D. Begamudre, “Extra High Voltage AC Transmission Engineering” Wiley Eastern.
2.K. R. Padiyar, “HVDC Power Transmission Systems: Technology and System Reactions” New Age International.
3.J. Arrillaga,“ High Voltage Direct current Transmission” IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, “High Voltage Engineering” Tata Mc Graw Hill.
Reference Books:
5.M. H. Rashid , “ Power Electronics : Circuits, Devices and Applications” Prentice Hall of India.
6.S. Rao, “EHV AC and HVDC Transmission Engineering and Practice” Khanna Publisher.
7.“EPRI, Transmission Line Reference Book, 345 KV and above” Electric Power Research Institute. Palo Alto, California, 1982.

NEE-042: POWER QUALITY

LT P
3 1 0

Unit-I

Introduction to Power Quality:

Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations**.**

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices- Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.

Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. C. Sankaran, " Power Quality" CRC Press.

NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, “Real-Time Systems”, Kluwer
2. R.Gupta, “Co-synthesis of Hardware and Software for Embedded Systems”, Kluwer
3. Shibu K.V., “Introduction to Embedded Systems”, TMH
4. Marwedel, “Embedded System Design”, Springer

NEE-044: SCADA

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3 1 0

UNIT I: SCADA:
Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierarchical Structure.
Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

UNIT II: Supervisory and Control Functions:
Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.
Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

UNIT III: MAN- Machine Communication:
Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

UNIT IV: Data basis- SCADA, EMS and network data basis.
SCADA system structure - local system, communication system and central system. Configuration-NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration.
Performance considerations: real time operation system requirements, modularization of software programming languages.

Text Books:
1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis",, Prentice Hall of India,
3. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
4. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11th Edition.

OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

L T P
3 1 0

UNIT-I :Introduction : Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II :Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III :Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV :Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V :Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations.
Waste Recycling Plants.

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford University Press.

NOE-082: NON-LINEAR DYNAMIC SYSTEMS

L T P
3 1 0

UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard's theorem, Peano's theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II

STABILITY-I:

Stability via Lyapunov's indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle's invariance principle.

UNIT-III

Stability-II

Lyapunov's direct method, converse Lyapunov's theorems, Brokett's theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy); control of chaos.

Reference Books:

1. D.K. Arrowsmith and C.M. Place, "An Introduction to Dynamical Systems" Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, "CHAOS: An Introduction to Dynamical System" Springer Verlag, 1997.
3. H.K. Khalis, "Nonlinear Systems" Prentice Hall, 1996.
4. R. R. Mohler, "Non linear systems, Vol-I: Dynamics and Control" Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, "Nonlinear Dynamics and Chaos" John Wiley & Sons, 1986.
6. Stanislaw H. Zak, "Systems and control" Oxford University Press, 2003.

NOE-083 : DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

L T P
3 1 0

Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, data definitions language, DML, overall database structure.
Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.
Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV: Foundation. Introduction to DATA Warehousing. Client / Server Computing model & Data Warehousing. Parallel processors & System. Distributed DBMS implementations. Client /Server RDBMS Solutions.

Unit-V: DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools. Metadata.
Data Mining: Introduction to data mining

Text Books:

1. Korth, Silbertz, Sudarshan, Database Concepts., Mc Graw Hill
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.
4. Mallach, Data Warehousing System., Mc. Graw Hill

Reference Books :

1. Elmasri, Navathe, Fundamentals of Database Systems., Addition Wesley
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
3. Majumdar & Bhattacharya, Database Management System., Tata Mc Graw Hill
4. Ramakrishnan, Gehrke, Database Management System., Mc Graw Hill.

NOE-084: AUTOMATION AND ROBOTICS

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3 1 0

1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.
   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automation” Wily Eastern.

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 07*	Open Elective-I**	3	1	0	30	20	50	100	150	4
2.	NEC 03*	Departmental Elective-III	3	1	0	30	20	50	100	150	4
3.	NEC 701	Optical Communication	3	1	0	30	20	50	100	150	4
4.	NEC 702B	Data Communication Networks	3	1	0	30	20	50	100	150	4
5.	NEC 703	VLSI Design	3	1	0	30	20	50	100	150	4
6.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
7.	NEC 751	Optical Communication & Networking Lab	0	0	2	-	20	20	30	50	1
8.	NEC 752A	Electronics Circuit Design Lab	0	0	3	-	20	20	30	50	2
9.	NEC 753	Industrial Training Viva-Voce	0	0	2	-	50	50	-	50	1
10.	NEC 754	Project	0	0	2	-	50	50	-	50	1
11.	NGP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**15**	**5**	**9**	**150**	**240**	**440**	**560**	**1000**	**26**

**** Open Electives-I**

NOE-071 Entrepreneurship Development
NOE-072 Quality Management
NOE-073 Operation Research
NOE-074 Introduction to Biotechnology
NOE-075 Micro and smart systems

AKTU, LUCKNOW, U.P
Study and Evaluation Scheme B. Tech. in Electronics Engg/Electronics & Communication Engg/Electronics & Telecommunication Engg
[Effective from the session 2016-17]

YEAR 4th, SEMESTER-VIII

S. No.	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
						SESSIONAL EXAM.			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1.	NOE 08*	Open Elective-II**	3	1	0	30	20	50	100	150	4
2.	NEC 04*	Departmental Elective-IV	3	1	0	30	20	50	100	150	4
3.	NEC 801	Wireless & Mobile Communication	3	1	0	30	20	50	100	150	4
4.	NEC 802	Optical Network	3	1	0	30	20	50	100	150	3
5.	AUC 001	*Human Values & Professional Ethics	2	0	0	15	10	25	50	75	-
PRACTICAL/DESIGN/DRAWING											
6.	NEC 851	Project	0	0	12	-	100	100	250	350	8
7.	NGP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	**12**	**4**	**12**	**120**	**180**	**350**	**650**	**1000**	**24**

**** Open Electives-II**

NOE-081 Non Conventional Energy Resources
NOE-082 Nonlinear Dynamic system
NOE-083 Product Development
NOE-084 Automation and Robotics

LIST OF ELECTIVES:

Elective – III NEC 03* Departmental Elective III

1. NEC 031 Information Theory & Coding
2. NEC 032 Digital Image Processing
3. NEC 033 Voice Over IP
4. NEC 034 Filter Design
5. NEC 035 Applied Fuzzy Electronic Systems

Elective – IV NEC 04* Departmental Elective IV

1. NEC 041 Electronic Switching
2. NEC 042 Digital System Design using VHDL
3. NEC 043 Speech Processing
4. NEC 044 Advanced Display Technologies & Systems
5. NEC 045 Satellite & RADAR systems

SYLLABUS

	NEC 701 OPTICAL COMMUNICATION	3 1 0
Unit	Topics	Lectures
I	Overview of optical fiber communication: The general system, Advantages of optical fiber communication. Optical spectral band. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection and the evanescent field, goos hanchen shift.	10
II	Cylindrical Fiber: modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor, The Gaussian approximation, equivalent step index methods. Signal distortion in optical fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers ,Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion-shifted fibers (MZ-DSF), Polarization: Fiber birefringence, polarization mode dispersion, polarization-maintaining fibers, Non linear effects: Scattering effects, Kerr effects.	10
III	Optical sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.	6
IV	Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, equilibrium numerical aperture. Photo detectors: Physical principles of photodiodes: The PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ration. Detector Response time: Depletion layer photocurrent, response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors.	6
V	Optical receiver operation: Fundamental receiver operation: Digital signal transmission, error sources, front end amplifier. Digital receiver performance: Probability of error receiver sensitivity, The Quantum Unit. Eye Diagram: Eye Pattern Features, BER and Q Factor Measurement Coherent Detection: Fundamental concepts, Homodyne detection, heterodyne detection, IBER comparisons. Digital links: Point to point links, power penalties.	8

Text Book:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3rd Edition, 2004.
2. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004.

NEC 702B DATA COMMUNICATION NETWORKS		3 1 0
Unit	Topics	Lectures
I	Communication problem and system models, components of communication systems, communication channels and their characteristics, mathematical models for communication channels, multiple access techniques, link budget analysis	8
II	Representation of deterministic and stochastic signals, random noise characterization in communication systems, signal-to-noise ratio, characterization of communication signals and systems: signal space representations, representation of analog and digitally modulated signals, spectral characteristics of modulated signals	8
III	Optimal receivers: Receivers for signals corrupted by AWGN, Error performance Analysis of receivers for memory-less modulation, optimal receivers for modulation methods with memory, OFDM, MIMO, Source Coding, Channel Coding (Hamming codes)	8
IV	Error Control, Flow Control, Sliding Window Protocols, HDLC, PPP, Local area networks: Ethernet, Fast Ethernet, Token Ring, Introduction to Gigabit Ethernet and Wireless LANs; Hubs, bridges and switches	8
V	**MAC Layer** Static Channel Allocation in LANs and MANs, Dynamic Channel Allocation in LANs and MANs, ALOHA, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited-Contention Protocols, Wavelength Division Multiple Access Protocols, Wireless LAN Protocols, IEEE Standard 802.3	8

Text Books:

1. Madhow, U., (2008), Fundamentals of Digital Communication, Cambridge University Press
2. Lathi, B. P. & Ding, Z., (2010), Modern Digital and Analog Communication Systems, Oxford University Press
3. Stallings, W., (2010), Data and Computer Communications, Pearson.
4. Andrew S. Tanenbaum, “Computer Networks” Pearson.
5. Ajit Pal, “Data Communication and Computer Networks”, PHI
6. Dimitri Bertsekas, Robert G. Gallager, “Data Networks”, Prentice Hall, 1992

NEC 703 VLSI DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: A Brief History, Preview, MOS Transistors, CMOS Logic, CMOS Fabrication and Layout, Design Partitioning, Logic Design, Circuit Design, Physical Design, Design Verification, Fabrication, Packaging and Testing.	8
II	Delay: Introduction, Transient Response, RC delay model, Linear Delay	8

	Model, Logical Effort of Paths, Timing Analysis Delay Models. Power: Introduction, Dynamic Power, Static Power	
III	Energy – Delay Optimization, Low Power Architectures. Interconnect: Introduction, Interconnect Modelling, Interconnect Impact, Interconnect Engineering, Logical Effort with Wires	8
IV	Dynamic logic circuits: Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic. Semiconductor memories: Introduction, DRAM, SRAM, ROM, flash memory.	8
V	Low – Power CMOS Logic Circuits: Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits. Design for Testability: Introduction, Fault Types and Models, Controllability and Observability, Ad Hoc Testable Design Techniques, Scan Based and BIST Techniques	8

Text Book:

1. Neil H.E.Weste, David Money Harris, "CMOS VLSI Design – A circuits and Systems Perspective" Pearson, 4th Edition

2. Sung-Mo Kang & Yosuf Leblebici, "CMOS Digital Integrated Circuits: Analysis & Design", TMH, 3rd Edition.

Reference Books:

1. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed., 1994.
2. W.Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ELECTIVES III

NEC 031 INFORMATION THEORY & CODING		3 1 0
Unit	Topic	Lectures
I	**Entropy**: Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship Between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy, and Mutual Information, Jensen's Inequality and Its Consequences, Log Sum Inequality and Its Applications, Data-Processing Inequality, Sufficient Statistics, Fano's Inequality	8
II	**Asymptotic Equipartition Property:** Asymptotic Equipartition Property Theorem, **Consequences of the AEP:** Data Compression, High-Probability Sets and the Typical Set Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding	8
III	**Channel Capacity:** Examples of Channel Capacity, 7.2 Symmetric Channels, Properties of Channel Capacity, Preview of the Channel Coding Theorem, Definitions, Jointly Typical Sequences, Channel Coding Theorem	8
IV	**Block Codes** Digital communication channel, Introduction to block codes, Single-parity-check codes, Product codes, Repetition codes, Hamming codes, Minimum distance of block codes, Soft-decision decoding, Automatic-repeat-request schemes **Linear codes** Definition of linear codes, Generator matrices, Standard array, Parity-check matrices, Error syndromes, Error detection and correction, Shortened and extended linear codes	8
V	**Convolution codes** Encoding convolutional codes, Generator matrices for convolutional codes, Generator polynomials for convolutional codes, Graphical representation of convolutional codes, Viterbi decoder	8

Text Books:

1. Joy A. Thomas, Thomas M. Cover, "Elements of information theory", Wiley-Interscience; 2 edition (July 18, 2006)
2. S. Gravano, "Introduction to Error Control Codes" OUP Oxford (24 May 2001)
3. Robert B. Ash, "Information Theory", Dover Publications (November 1, 1990)
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms " Wiley, 2005

NEC 032 DIGITAL IMAGE PROCESSING		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Overview of Image Processing, Nature of Image Processing, Application area of image processing, Digital Image Representation, Types of images, Digital Image Processing Operations, Fundamental steps in DIP, Overview of Digital Image Systems, Physical Aspect of Image Acquisition, biological Aspect of Image Acquisition, sampling & quantization, Digital Halftone Process, Image storage and File formats.	8
II	**Image Transforms:** Need for image transforms, Properties of Fourier transform, Discrete cosine transform, Discrete sine transform, Hadamard transform, Haar transform, Slant transform, SVD and KL transforms, Comparison between transforms. **Image Enhancement:** Image Quality and Need for image enhancement, Image enhancement operations, Image enhancement in spatial domain, histogram based techniques, Spatial Filtering concepts, Image smoothing spatial filters, Image Sharpening spatial filters, Image smoothing in frequency domain filtering, Image sharpening in frequency domain, Homomorphism filtering.	8
III	**Image Restoration:** Introduction to degradation, Types of Image degradations, image degradation models, noise modeling, Estimation of degradation functions, Image restoration in presence of noise only, Periodic noise and band – pass and band reject filtering, difference between enhancement & restoration, Image restoration techniques.	8
IV	**Image Compression:** Image compression model, Compression algorithms and its types, Type of redundancy, lossless compression algorithms, Lossy compression algorithms, Image and video compression standards.	8
V	**Image Segmentation:** Introduction, Detection of Discontinuities, Edge Detection, Hough Transforms and Shape Detection, corner detection, Principle of thresholding, Principle of region - growing.	8

Text Books:

1. S. Sridhar, "Digital Image Processing", OXFORD University Press, Second Edition.
2. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image'', Pearson.
3. Rafael C. Gonzalez Richard E woods Steven L. Eddins, ''Digital Image Processing Using MATLAB'', Mc Graw Hill, 2nd Edition.
4. Anil K Jain, ''Fundamentals of Digital Image Processing", Pearson.

NEC 033 VOICE OVER IP		3 1 0
Unit	Topic	Lectures
I	**Introduction:** Carrier-Grade, VoIP, VoIP Challenges, Overview of the IP Protocol Suite, The Internet Protocol, IP Version 6, IP Multicast, The Transmission Control Protocol, The User Datagram Protocol, The Stream Control Transmission Protocol, The Real-Time Transport Protocol, The RTP Control Protocol, Security and Performance Optimization **Speech-Coding Techniques** A Little about Speech, Audio, and Music, Voice Sampling, Voice Quality, Types of Speech Coders, Waveform Coders, Analysis-by-Synthesis Codecs, G.722–Wideband Audio	8
II	**Signaling Protocols:** H.323: Multimedia Conferencing over IP The H.323 Architecture, RAS Signaling, Call Signaling, Call Scenarios, H.245 Control Signaling, Conference Calls, Securing an H.323 Network. **The Session Initiation Protocol** The SIP Architecture, Overview of SIP Messaging Syntax, Examples of SIP Message Sequences, Redirect and Proxy Servers, The Session Description Protocol, Usage of SDP with SIP, SIP Extensions and Enhancements, Usage of SIP for Features and Services, Interworking	8
III	**Distributed Gateways and the Softswitch Architecture** Separation of Media and Call Control, Softswitch Architecture, Protocol Requirements for Controlling Media Gateways, Protocols for Controlling Media Gateways, MGCP, MEGACOP/H.248.1.	8
IV	**VoIP and SS7** The SS7 Protocol Suite, SS7 Network Architecture, ISUP, Performance Requirements for SS7, SIGTRAN, Interworking SS7 and VoIP Architectures	8
V	**Quality of Service** The Need for QoS, Overview of QoS Solutions, The Resource Reservation Protocol, DiffServ, Multiprotocol Label Switching, Combining QoS Solutions	8

Text Books:

1. Richard Swale, Daniel Collins,“ Carrier-Grade VoIP”, McGraw-Hill Education 3rd Edition,2014.
2. Olivier Hersent, Jean Pierre Petit, David Gurle, “IP Telephony – Deploying Voice Over-IP Protocols”, John Wiley & Sons Ltd, 2005

NEC 034 FILTER DESIGN		3 1 0
Unit	Topic	Lectures
I	Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modelling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Noninverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.	8
II	First order filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design.	8
III	Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits, Integrators and others biquads.	8
IV	Second order filters with arbitrary transmission zeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.	8
V	Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.	8

Text Book:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, "Analog Filter Design", 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,"Applications and Design with Analog Integrated Circuits", Second edition, Pearson.

2. T. Deliyannis, Yichuang Sun, J.K. Fidler, "Continuous-Time Active Filter Design", CRC Press.

NEC 035 APPLIED FUZZY ELECTRONIC SYSTEMS		3 1 0
Unit	Topic	Lectures
I.	History of Fuzzy Logic, Fuzzy Sets, Possibility Distributions, Fuzzy Rules, Fuzzy Sets, Operations of Fuzzy Sets, Properties of Fuzzy Sets, Geometric Interpretations of Fuzzy Sets, Possibility Theory, Fuzzy Relations and their Compositions, Fuzzy Graphs, Fuzzy Numbers, Functions with Fuzzy Arguments, Arithmetic Operations of Fuzzy Numbers.	8
II.	Fuzzy Rules: Fuzzy Mapping Rule, Fuzzy Implication Rule, Fuzzy Rule Based Models for Function Approximations, Theoretical Foundation of Fuzzy Mapping Rules, Types of Fuzzy Rule Based Models: Mamdani Model, TSK Model, Standard Additive Model, Fuzzy Implications and Approximate Reasoning: Propositional Logic, First Order Predicate Calculus, Fuzzy Implications, Approximate Reasoning, Criteria and Family of Fuzzy Implications, Possibility vs. Probability, Probability of Fuzzy Event, Probabilistic Interpretations of Fuzzy Sets, Fuzzy Measure.	8
III.	Uncertainty in information; Classical Sets, Fuzzy Sets and their properties; Cardinality of Classical Relations and their properties, The a- Level Set, Cardinality of Fuzzy Relations and their properties; Composition; Tolerance and Equivalence relationship; Membership Functions; Fuzzification and Defuzzification process; Fuzzy to Crisp Conversions; Lambda cuts; Extension Principle, Crisp functions and its mapping, Fuzzy functions and its mapping; Fuzzy Numbers; Internal Analysis in Arithmetic.	8
IV.	Approximate method of Extension, Vertex Method, DSW Algorithm, and Restricted DSW Algorithm and their comparison, Classical Predicate Logic; Fuzzy Logic; Approximate Reasoning; Fuzzy Tautologies, Contradictions, Equivalence, and Logical Proof; Fuzzy Rule Based Systems, Models of Fuzzy AND, OR, and Inverter; Fuzzy Algebra; Truth Tables; Fuzzy Functions; Concept of Fuzzy Logic Circuits; Fuzzy Flip-Flop; Fuzzy Logic Circuits in Current Mode, Furry Numbers.	8
V.	Fuzzy Logic in Control Engineering: Fundamental Issues in Control Engineering, Control Design Process, Semiformal Aspects of Design Process, Mamdani Architecture of Fuzzy Control, The Sugeno-Takagi Architecture. Fuzzy Logic in Hierarchical Control Architecture, Historical Overview and Reflections on Mamdani`s Approach, Analysis of Fuzzy Control System via Lyapunov`s Direct Method, Linguistic Approach to the analysis of Fuzzy Control System, Parameter Plane Theory of Stability, Takagi-Sugeno-Kang Model Of Stability Analysis.	8

Text Book:

1. John Yen, Reza Langari, “Fuzzy Logic: Intellegent Control and Information”, Pearson Publication.
2. Ahmad M. Ibrahim, “Introduction to Applied Fuzzy Electronics”, Prentice Hall Publication.
3. Ahmad M. Ibrahim, “Fuzzy Logic for Embedded Systems Applications”, Newnes Publications.
4. Witold Pedrycz, Fernando Gomide, “Fuzzy Systems Engineering: Toward Human-Centric Computing”, John Wiley Publications.

NEC 751 Optical Communication & Networking Lab

Part - A

1. Familiarisation of different types of cables and different commands.

a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper

b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable

c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector

d) Crimping of RJ45 connector using Crimping tool

e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)

f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router

a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.

b) Different types of show commands & their purpose.

c) Assignment of IP address and enabling layer 3 connectivity.

d) Implement sub netting

3. Configuring web and DHCP servers

a) Understand Internet Information Services tool and its installation.

b) To configure web services using IIS tool.

c) Configure DHCP

4. Configuring VLAN

a) Understand the configuration of Vlan in a switch

b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network

c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using (i) Connection oriented and (ii) Connectionless sockets

Part – B (Any 4 Experiments):

1. To setting up fiber optic analog link.
2. Study and measurement of losses in optical fiber.
3. Study and measurement of numerical aperture of optical fiber.
4. Study and perform time division multiplexing (digital).
5. Study of framing in time division multiplexing.
6. Study of Manchester coding and decoding.
7. Study of voice coding and codec chip.
8. Study and measure characteristics of fiber optic LED’s and photo detector.

NEC 752A Electronics Circuit Design Lab.

In this practical course students will carry out a design oriented project work using various analog/ digital building blocks which they have already studied in their analog electronic/ digital electronic courses such as Electronic circuits, integrated circuits and filter design. The project may include but not restricted to any of the following:

1. Universal op-amp based biquad
2. Universal OTA biquad
3. Amplitude control or stabilization applied to any sinusoidal oscillators
4. Op-amp/ OTA based function generator
5. Any application of log/antilog circuits
6. Any applications of analog multiplier/ divider
7. Any digital system design and its hardware implementation using TTL/ CMOS ICs
8. Any circuit idea (not studied in the course) using 555 Timer in conjunction with any other ICs

The above must include

1. Design the circuit.
2. Make hardware and measure various parameters.
3. Simulation in Spice of the designed circuit.
4. Comparison of measured and simulated results.

A report is to be made for evaluation.

NEC 801 Wireless & Mobile Communication		3 1 0
Unit	Topic	Lectures
I	Evolution of mobile radio communication fundamentals. General Model of Wireless Communication Link, Types of Signals, Cellular Infrastructure, Cellular System Components, Antennas for Cellular Systems, Operation of Cellular Systems, Channel Assignment, Frequency reuse, Channel Assignment strategies, Handoff Strategies Cellular Interferences, Sectorization; Wireless Channel and Radio Communication, Free Space Propagation Model, Channel Noise and Losses, Fading in Land Mobile Systems, Multipath Fading, Fading Effects on Signal and Frequency, Shadowing; Wireless Channel Modeling: AWGN Channel, Rayleigh Channel, Rician Fading Channel, Nakagami Fading Channel, Ocumura and Hata Path Loss Model; Channel Modelling: Stochastic, Flat Fading, Wideband Time-Dispersive Channel Modelling.	8
II	Theory of Vocoders, Types of Vocoders; Spread Spectrum Modulation, Pseudo-Noise Codes with Properties and Code Generation Mechanisms, DSSS and FHSS Systems, Time Hopping and Hybrid Spread Systems; Multicarrier Modulation Techniques, Zero Inter Symbol Interference Communication Techniques, Detection Strategies, Diversity Combining Techniques: Selection Combining, Threshold Combining, Equal Gain Combining, Maximum Ratio Combining; Spatial Diversity and Multiplexing in MIMO Systems, Channel Estimation,	8
III	Equalization Techniques: Transversal Filters, Adaptive Equalizers, Zero Forcing Equalizers, Decision Feedback Equalizers, and related algorithms; Multiplexing and Multiple Access: FDMA, TDMA, CDMA, OFDMA, SC-FDMA, IDMA Schemes and Hybrid Method of Multiple Access Schemes, RAKE Receiver; Multiple Access for Radio Packet Systems: Pure ALOHA, Slotted ALOHA, CSMA and their versions; Packet and Pooling Reservation Based Multiple Access Schemes.	8
IV	GSM system for mobile Telecommunication, General Packet Radio Service, Edge Technology; CDMA Based Standards: IS 95 to CDMA 2000, Wireless Local Loop, IMT 2000 and UMTS, Long Term Evolution (LTE), Mobile Satellite Communication.	8
V	Introduction to Mobile Adhoc Networks, Bluetooth, Wi-Fi Standards, WiMax Standards, Li-Fi Communication, Ultra-Wideband Communication, Mobile data networks, Wireless Standards IMT 2000, Introduction to 4G and concept of NGN.	8

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson Publications, Second Edition.
2. Upena Dalal, “Wireless Communication and Networks”, Oxford Press Publications.
3. T L Singal ,“Wireless Communications ”, McGraw Hill Publications.

Reference Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press.
2. S. Haykin & M. Moher, “Modern wireless communication”, Pearson, 2005.

NEC 802 OPTICAL NETWORK		3 1 0
Unit	Topic	Lectures
I	Introduction to Optical Network:- Optical Networks: multiplexing techniques, second generation optical networks. The optical layer, optical packet switching. Transmission Basics: wavelength, frequencies and channel spacing, wavelength standards. Non linear Effects: Effective length and area, stimulated brillouin scattering, stimulated raman scattering, Propagation in a non linear medium, self phase modulation, cross phase modulation Four wave mixing.	8
II	Components:-Couplers: Principles of operation, Conservation of energy, Isolators and circulators: Principles of operation Multiplexers and filters: Gratings, diffraction pattern, Bragg grating, Fiber gratings, Fabry-perot filters, multilayers dielectric thin – film filters, Mach-Zehnder interferometers, Arrayed waveguide grating, Acousto-optic tunable filter, High channel count multiplexer Architecture. Switching : large optical switches, Optical switch Technologies, large electronic switches wavelength converters: Optoelectronic Approch , optical grating, interferometric techniques wave mixing. Crosstalk: Intra-channel crosstalk, inter-channel crosstalk, crosstalk in Networks, Bidirectional system crosstalk reduction.	8
III	Networks- SONET/SDH: Multiplexing, SONET/SDH layers, SONET Frame structure, SONET/SDH physical layer, Elements of a SONET/SDH infrastructure. ATM: Function of ATM, Adaptation layers, Quality of service. IP: Routing and forwarding, QOS, WDM Network elements: Optical line terminals, Optical line amplifiers,. Optical add/Drop multiplexers: Architecture, reconfigurable OADMS, Optical cross connects: All optical OXC configuration.	8
IV	WDM Network Design Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability, Basic Concepts, Protection in SONET/SDH, Protection in client layer, Optical Layer Protection, Different Schemes, Interworking between Layers, Access Networks, Network Architecture Overview, Enhanced HFC, FTTC, PON evolution	8
V	Optical Switching, OTDM, Synchronization, Header Processing, Buffering, Burst Switching, Deployment Considerations- SONET/SDH core Network	8

Text Books:

1. R. Ramaswami, & K. N. Sivarajan, "Optical Networks a Practical perspective", Morgan Kaufmann Publishers, 3rd Ed.
2. U. Black, "Optical Networks: Third Generation Transport Systems"/ Pearson Educations

Reference Books:

1. Biswanath Mukherjee "Optical WDM Networks" Springer Pub 2006.

ELECTIVE IV

	NEC 041 ELECTRONIC SWITCHING	3 1 0
Unit	Topic	Lectures
I	Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register-transiator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.	8
II	Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems , Digital Switching in an Analog Environment.	8
III	Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems	8
IV	Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signalling: Introduction, Customer line signalling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter-register signalling, Common-channel signalling principles, CCITT signalling system no. 6 and 7, Digital customer line signalling.	8
V	Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space-Memory switch, Banyan Network Switch).	8

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, “Telecommunication Switching Systems and Networks”, PHI.

2. J.E. Flood, “Telecommunication Switching, Traffic and Networks”, Pearson Education.

3. John C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

NEC 042 DIGITAL SYSTEM DESIGN USING VHDL		3 1 0
Unit	Topic	Lectures
I	Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.	8
II	Digital System Design Automation– Abstraction Levels, System level design flow, RTL design flow, VHDL. RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration	8
III	Concurrent Constructs for RT level Descriptions – Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements. VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE – related issues, Predefined Attributes	8
IV	VHDL Signal Model – Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution.	8
V	Hardware Cores and Models - Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts. Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.	8

Text Books:

1. Z. Navabi, “VHDL-Modular Design and Synthesis of cores and Systems”, TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, “Introduction to VHDL” Spriger Publication, 2010.
3. J Bhasker , “VHDL Primer” –Pearson Education.

Reference Books:

3. C. H. Roth, “Digital System Design using VHDL”, PWS Publishing

4. Douglas Perry, “VHDL- Programming by examples”, MGH

NEC 043 SPEECH PROCESSING		3 1 0
Unit	Topic	Lectures
I	Digital models for speech signals: Mechanism of speech production & acoustic phonetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.	6
II	Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.	10
III	Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder.	8
IV	Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.	6
V	Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.	10

Text / Reference Books:

1. R. L. Rabiner & R.W. Schafer, “Digital Processing of speech signals”, Pearson Education.
2. B. Gold and Nelson Morgon, “Speech and audio signal processing”, Wiley India Edition, 2006.

NEC 044 ADVANCED DISPLAY TECHNOLOGIES & SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Properties of Light, Geometric Optics, Optical Modulation; Vision and Perception: Anatomy of Eye, Light Detection and Sensitivity, Spatial Vision and Pattern Perception, Binocular Vision and Depth Perception; Driving Displays: Direct Drive, Multiplex and Passive Matrix, Active Matrix Driving, Panel Interfaces, Graphic Controllers, Signal Processing Mechanism; Power Supply: Fundamentals, Power Supply Sequencing.	8
II	Display Glasses, Inorganic Semiconductor TFT Technology, Organic TFT Technology; Transparent Conductors, Patterning Processes: Photolithography for Thin Film LCD, Wet Etching, Dry Etching; Flexible Displays: Attributes, Technologies Compatible with Flexible Substrate and Applications, TFT Signal Processing Techniques; Touch Screen Technologies: Introduction, Coatings, Adhesive, Interfaces with Computer Mechanism.	8
III	Inorganic Phosphors, Cathode Ray Tubes, Vacuum Florescent Displays, Filed Emission Displays; Plasma Display Panels, LED Display Panels; Inorganic Electroluminescent Displays: Thin Film Electroluminescent Displays, AC Powder Electroluminescent Displays; Organic Electroluminescent Displays: OLEDs, Active Matrix for OLED Displays; Liquid Crystal Displays: Fundamentals and Materials, Properties of Liquid Crystals, Optics and Modeling of Liquid Crystals; LCD Device Technology: Twisted Numeric and Super twisted Numeric Displays, Smectic LCD Modes, In-Plane Switching Technology, Vertical Aligned Nematic LCD Technology, Bistable LCDs, Cholesteric Reflective Displays; LCD Addressing, LCD Backlight and Films, LCD Production, Flexoelectro-Optic LCDs.	8
IV	Paper like and Low Power Displays: Colorant Transposition Displays, MEMs Based Displays, 3-D Displays, 3-D Cinema Technology, Autostereoscopic 3-D Technology, Volumetric and 3-D Volumetric Display Technology, Holographic 3-D Technology; Mobile Displays: Trans-reflective Displays for Mobile Devices, Liquid Crystal Optics for Mobile Displays, Energy Aspects of Mobile Display Technology.	8
V	Microdisplay Technologies: Liquid Crystals on Silicon Reflective Microdisplay, Transmissive Liquid Crystal Microdisplay, MEMs Microdisplay, DLP Projection Technology; Microdisplay Applications: Projection Systems, Head Worn Displays; Electronic View Finders, Multifocas Displays, Occlusion Displays, Cognitive Engineering and Information Displays; Display Metrology, Standard Measurement Procedures, Advanced Measurement Procedures: Spatial Effects, Temporal Effects, Viewing Angle, Ambient Light; Display Technology Dependent Issues, Standards and Patterns, Green Technologies in Display Engineering.	8

Text Book:

1. Janglin Chen, Wayne Cranton, Mark Fihn , “Handbook of Visual Display Technology”, Springer Publication.

NEC 045 SATELLITE & RADAR SYSTEMS		3 1 0
Unit	Topic	Lectures
I	Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar. The Radar Equation: Detection of signals in noise , Receiver noise and the signal to noise ratio, Probabilities of detection and false alarm, Integration of Radar Pulses, Radar cross section of targets, Radar cross section fluctuations, Transmitter Power, Pulse Reception Frequency , Antenna Parameters, System Losses.	8
II	MTI and Pulse Doppler Radar: Introduction to Doppler and MTI Radar, Delay Line cancellers, Staggered Pulse Reception Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance.	8
III	Tracking Radar: sequential lobing, conical scan, monopulse Tracking, low angle tracking, tracking in range. Elements of Satellite Communications, Orbital mechanics, look angle and orbit determination, launches and launch vehicle, orbital effects. Introduction to geo-synchronous and geo-stationary satellites.	8
IV	Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.	8
V	Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS receivers and codes, Satellite Signal Acquisition, GPS navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation.	8

Text / Reference Books:

1. Merrill I. Skolnik “ Introduction to Radar Systems”, Mc Graw- Hill.
2. J.C.Toomay, Paul J. Hannen “Principles of Radar”, PHI Learning.
3. B.Pratt, A.Bostian, “Satellite Communications”, Wiley India.
4. D.Roddy, ”Satellite Communications”, TMH.

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-701	ELECTRIC DRIVES	3	1	0	30	20	50	100	150	4
2	NEE-702	POWER STATION PRACTICE	3	1	0	30	20	50	100	150	4
3	NEC-702A	ANALOG & DIGITAL COMMUNICATION	3	1	0	30	20	50	100	150	4
4	NEE-031-033, NCS-039	DEPARTMENTAL ELECTIVE-III	3	1	0	30	20	50	100	150	4
5	NOE-071-NOE-074	OPEN ELECTIVE-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
6	NEE-751	ELECTRIC DRIVE LAB	0	0	3	10	10	20	30	50	1
7	NEC-752B	ADC LAB	0	0	3	10	10	20	30	50	1
8	NEE-753	INDUSTRIAL TRAINING	0	0	2	30	20	50	--	50	1
9	NEE-754	PROJECT	0	0	2	30	20	50	--	50	1
10	NGP-701	GP					50	50	--	50	1
		TOTAL	16	5	10					1000	24

LIST OF DEPARTMENTAL ELECTIVE-III

NEE-031 POWER SYSTEM OPERATION AND CONTROL
NEE-032 ADVANCED MICROPROCESSORS AND MICROCONTROLLERS
NEE-033 FLEXIBLE AC TRANSMISSION SYSTEMS
NCS-039 OBJECT ORIENTED SYSTEMS AND C++

LIST OF OPEN ELECTIVE-I

NOE-071 ENTREPRENEURSHIP DEVELOPMENT
NOE-072 QUALITY MANAGEMENT
NOE-073 OPERATION RESEARCH
NOE-074 INTRODUCTION TO BIO TECHNOLOGY

STUDY AND EVELUATION SCHEME OF ELECTRICAL ENGINEERING
VIIIth Semester

S. NO.	SUBJECT CODE	NAME OF THE SUBJECT	PERIODS			EVALUATION SCHEME				SUBJECT TOTAL	CREDIT
						SESSIONAL ASSESMENT			ESE		
			L	T	P	CT	TA	TOTAL			
THEORY SUBJECT											
1	NEE-801	ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS	3	1	0	30	20	50	100	150	4
2	NEE-802	UTILIZATION OF ELECTRICAL ENERGY AND TRACTION	3	1	0	30	20	50	100	150	3
3	NEE-041 - NEE-044	DEPARTMENTAL ELECTIVE-IV	3	1	0	30	20	50	100	150	4
4	NOE-081 - NOE-084	OPEN ELECTIVE-2	3	1	0	30	20	50	100	150	4
PRACTICAL/DESIGN/DRAWING											
5	NEE-851	PROJECT	0	0	12	0	100	100	250	350	8
6	NGP-801	GP					50	50	-	50	1
		TOTAL	14	5	12		180	350	650	1000	24

LIST OF DEPARTMENTAL ELECTIVE IV

NEE-041 EHVAC&DC TRANSMISSION
NEE-042 POWER QUALITY
NEE-043 EMBEDDED SYSTEM
NEE-044 SCADA

LIST OF OPEN ELECTIVE 2

NOE-081 NON-CONVENTIONAL ENERGY RESOURCES
NOE-082 NON LINEAR DYNAMIC SYSTEMS
NOE-083 DATA BASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING
NOE-084 AUTOMATION & ROBOTICS

NEE701/NEN 701: Electric Drives

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3 1 0

UNIT-I: Fundamentals of Electric Drive: Electric Drives and its parts, advantages of electric drives Classification of electric drives Speed-torque conventions and multi-quadrant operations Constant torque and constant power operation
Types of load Load torque: components, nature and classification

UNIT-II: Dynamics of Electric Drive: Dynamics of motor-load combination Steady state stability of Electric Drive Transient stability of electric Drive
Selection of Motor Power rating: Thermal model of motor for heating and cooling, classes of motor duty, determination of motor power rating for continuous duty, short time duty and intermittent duty. Load equalization

UNIT-III: Electric Braking: Purpose and types of electric braking, braking of DC, three phase induction and synchronous motors
Dynamics During Starting and Braking: Calculation of acceleration time and energy loss during starting of DC shunt and three phase induction motors, methods of reducing energy loss during starting. Energy relations during braking, dynamics during braking

UNIT-IV: Power Electronic Control of DC Drives: Single phase and three phase controlled converter fed separately excited DC motor drives (continuous conduction only), dual converter fed separately excited DC motor drive, rectifier control of DC series motor. Supply harmonics, power factor and ripples in motor current Chopper control of separately excited DC motor and DC series motor.

UNIT-V: Power Electronic Control of AC Drives:
Three Phase induction Motor Drive:
Static Voltage control scheme, static frequency control scheme (VSI, CSI, and cyclo – converter based) static rotor resistance and slip power recovery control schemes.
Three Phase Synchronous motor:
Self controlled scheme
Special Drives:
Switched Reluctance motor, Brushless dc motor. Selection of motor for particular applications

Text Books:
1. G.K. Dubey, “Fundamentals of Electric Drives”, Narosa publishing House.
2. S.K. Pillai, “A First Course on Electric Drives”, New Age International.
3. B.N. Sarkar, “Fundamental of Industrial Drives”, Prentice Hall of India Ltd.

Reference Books:
1 M. Chilkin, “Electric Drives”,Mir Publishers, Moscow.
2 Mohammed A. El-Sharkawi, “Fundamentals of Electric Drives”, Thomson Asia, Pvt. Ltd. Singapore.
3 N.K. De and Prashant K. Sen, “Electric Drives”, Prentice Hall of India Ltd.
4 V. Subrahmanyam, “Electric Drives: Concepts and Applications”, TataMcGraw Hill.

NEE 702/NEN702: POWER STATION PRACTICE

L T P
3 1 0

UNIT-I:Introduction: Electric energy demand and growth in India, electric energy sources.
Thermal Power Plant: Site selection, general layout and operation of plant, detailed description and use of different parts.
Hydro Electric Plants: Classifications, location and site selection, detailed description of various components, general layout and operation of Plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages & disadvantages, hydro-potential in India

UNIT-II: Nuclear Power Plant: Location, site selection, general layout and operation of plant. Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.
Gas Turbine Plant: Operational principle of gas turbine plant & its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.
Diesel Plants: Diesel plant layout, components & their functions, its performance, role and applications

UNIT-III: Sub-stations Layout: Types of substations, bus-bar arrangements, typical layout of substation.
Power Plant Economics and Tariffs: Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff; Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

UNIT-IV: Economic Operation of Power Systems: Characteristics of steam and hydro-plants, Constraints in operation, Economic load scheduling of thermal plants Neglecting and considering transmission Losses, Penalty factor, loss coefficients, Incremental transmission loss. Hydrothermal Scheduling

UNIT-V:Non Conventional Energy Sources: Power Crisis, future energy demand, role of Private sectors in energy management, concepts & principals of MHD generation, Solar power plant, Wind Energy, Geothermal Energy, Tidal energy, Ocean Thermal Energy.

Text Books:
1. B.R. Gupta, “Generation of Electrical Energy”, S. Chand Publication.
2. Soni, Gupta & Bhatnagar, “A text book on Power System Engg.”, Dhanpat Rai & Co.
3. P.S.R. Murthy, “Operation and control of Power System” BS Publications, Hyderabad.

Reference Books:
4. W. D. Stevenson, “Elements of Power System Analysis”, McGraw Hill.
5. S. L. Uppal, “Electrical Power”, Khanna Publishers.

NEC702A Analog & Digital Communication

UNIT I:

Elements of communication system and its limitations Amplitude Modulation: Amplitude modulation and detection, Generation and detection of DSB-SC, SSB and vestigial side band modulation, carrier acquisition AM transmitters and receivers, super hetrodyne receiver, IF amplifiers, AGC circuits Frequency Division multiplexing

UNIT II:

Angle Modulation: Basic definitions Narrow band and wideband frequency modulation, transmission bandwidth of FM signals Generation and detection of frequency modulation Noise: External noise, internal noise Noise calculations, signal to noise ratio Noise in AM and FM systems

UNIT III:

Pulse Modulation: Introduction, sampling process Analog Pulse Modulation Systems-Pulse Amplitude Modulation, Pulse width modulation and Pulse Position Modulation. Waveform coding Techniques: Discretization in time and amplitude, Quantization process, quantization noise, Pulse code Modulation, Differential Pulse code Modulation, Delta Modulation and Adaptive Delta Modulation.

UNIT IV:

Digital Modulation Techniques: Types of digital modulation, waveforms for amplitude, frequency and phase shift keying, methods of generation of coherent and noncoherent, ASK,FSK and PSK, comparison of above digital techniques.

UNIT V:

Time Division Multiplexing: Fundamentals, Electronic Commutator, Bit/byte interleaving, TI carrier system, synchronization and signaling of TI, TDM and PCM hierarchy, synchronization techniques Introduction to Information Theory: Measure of information, Entropy & Information rate, channel capacity, Hartley Shannan law, Huffman coding, shannan Fano coding.

Text Books:

1.Simon Haykin,“ Communication Systems” John Wiley & Sons 4th Edition
2.G.Kennedy and B. Davis,” Electronic Communication Systems” 4th Edition, Tata McGraw Hill
3. Simon Haykin, “Digital Communications” John Wiley & Sons
4. T.L. Singal, “Analog & Digital Communication”, Tata Mc Graw Hill

Reference Books:

1. B.P. Lathi, “Modern Analog & Digital Communication Systems” Oxford University Press.
2. Taub & Schilling, “Communication System: Analog and Digital” Tata Mc Graw Hill
3. R.P. Singh & S.D. Sapre, “Communication Systems Analog and Digital” Tata McGraw Hill.

NEE –031/NEN-031: POWER SYSTEM OPERATION AND CONTROL

L T P
3 1 0

UNIT-I: Introduction: Structure of power systems, Power system control center and real time computer control, SCADA system Level decomposition in power system Power system security Various operational stages of power system Power system voltage stability

UNIT-II: Economic Operation: Concept and problems of unit commitment Input-output characteristics of thermal and hydro-plants System constraints Optimal operation of thermal units without and with transmission losses, Penalty factor, incremental transmission loss, transmission loss formula (without derivation) Hydrothermal scheduling long and short terms Concept of optimal power flow

UNIT-III: Load Frequency Control:
Concept of load frequency control, Load frequency control of single area system:
Turbine speed governing system and modeling, block diagram representation of single area system, steady state analysis, dynamic response, control area concept, P-I control, load frequency control and economic dispatch control. Load frequency control of two area system: Tie line power modeling, block diagram representation of two area system, static and dynamic response

UNIT-IV: Automatic Voltage Control: Schematic diagram and block diagram representation, different types of Excitation systems & their controllers.
Voltage and Reactive Power control: Concept of voltage control, methods of voltage control-control by tap changing transformer. Shunt Compensation, series compensation, phase angle compensation

UNIT-V
State Estimation:Detection and identification, Linear and non-linear models.
Flexible AC Transmission Systems:
Concept and objectives FACTs controllers: Structures & Characteristics of following FACTs Controllers. TCR,FC-TCR, TSC, SVC, STATCOM, TSSC, TCSC, SSSC, TC-PAR, UPFC

Text Books:
1. D.P. Kothari & I.J. Nagrath, "Modern Power System Analysis" Tata Mc Graw Hill, 3rd Edition.
2. P.S.R. Murty, "Operation and control in Power Systems" B.S. Publications.
3. N. G. Hingorani & L. Gyugyi, " Understanding FACTs" Concepts and Technology of Flexible AC Transmission Systems"
4. A. J. Wood & B.F. Wollenburg, " Power Generation, Operation and Control " John Wiley & Sons.
Reference Books:
1. O.I. Elgerd, "Electric Energy System Theory" Tata McGraw Hill.
2. P. Kundur, " Power System Stability and Control Mc Graw Hill.
3. T. K. Nagsarkar & M.S. Sukhiza,' Power System Analysis' Oxford University Press.

NEE-032/NEN032:
ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P
3 1 0

Unit-I: Mode of operation of higher order processors: Real mode and protected mode Real mode and protected mode memory addressing, access right byte, Memory paging, System descriptors, Multi Tasking & TSS.

Unit-II: Instruction Set of higher order processors(8086 to Pentium): Comparison with 8086 in real mode: Generalized instruction set format Addressing Mode: DRAM & BRAM Categorization of instruction set of INTEL processors.
Integer instructions: Data transfer instructions, arithmetic and logical operations, string instructions, branch control instructions, procedure call instruction and return instruction.

Unit-III: Processing of CALLS, INTERRUPTS & EXCEPTIONS: Privilege levels; ENTER and LEAVE Instructions, INT N. IRET. Interrupt processing sequence, Protected mode interrupts.

Unit-IV: Assembly Level Programming: ROM BIOS Routines, MS DOS BIOS Routines, Assembling a progam using Assembler, exe and. com programs. Mixed Language Programming: using Assembly with C/C ++

Unit-V
Microcontrollers: Introduction, basic functions, applications of 8-bit and 16-bit microcontrollers.
8-bit microcontrollers INTEL 8051: Internal Architecture, signals, memory organization and interfacing,Timing and control, port operations, interrupts and I/O addressing. Instruction Set and programming.
16-bit microcontrollers INTEL 8096: Architectural description, memory Organization and interfacing, I/O addressing, Interrupts, instruction set and programming.

Text Books:
1. Ray, A.K. & Burchandi, K.m., “Advanced Microprocessors and Peripherals: Architeacture, Programming and Interfacing” Tata Mc.Graw Hill.
2. Renu Sing & B.P.Singh, “Advanced Microprocessors and Microcontrollers” New Age International.
3. Krishna Kant,”Microprocessors and Microcontrollers” PHI Learning.
4. Brey, Barry B. “The INTEL Microprocessors” Pearson Education.

Reference Books:
1. Ayala, “The 8051 Micro Controller”, Centage Learning.
2. Mazidi M.A., Maizidi J.G. Mckinlay R.D., “The 8051 Microcontroller and Embedded Systems” Pearson Education.
3. Rajkamal, “The concept and feature of microcontrollers 68HC11, 8051 and 8096”, S.Chand Publisher, New Delhi
4. Peatman John, “Design with microcontroller”, Mc.-Graw Hill Publishing.

NEE033/NEN033: FLEXIBLE AC TRANSMISSION SYSTEMS

L T P
3 1 0

UNIT I: Introduction: Reactive power control in electrical power transmission lines - Uncompensated transmission line – series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II: Static Var Compensator (SVC) And Applications
Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer Enhancement of power system damping.

UNIT III: Thyristor Controlled Series Capacitor (TCSC) And Applications
Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping.

UNIT IV: Voltage Source Converter Based Facts Controllers
Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability – prevention of voltage instability. SSSC-operation of SSSC and the control of power flow – modelling of SSSC in load flow and transient stability studies.

TEXT BOOKS:
1. R.Mohan Mathur, Rajiv K.Varma, "Thyristor – Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc, 2002.
2. Narain G. Hingorani, "Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems", Standard Publishers Distributors, Delhi- 110 006, 2011.
3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCES:
1. A.T. John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE) 1999.
2. V.K. Sood, HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.
3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System: Modelling and Control" Springer, 2012.

NCS – 039: OBJECT ORIENTED SYSTEMS AND C++

L T P
3 1 0

Unit-I

Object & classes, Links and Associations, Generalization and Inheritance, Aggregation, Abstract classes, Generalization, Multiple Inheritance, Meta data.

Unit-II

Events and States, Operations and Methods, Nested state diagrams, Concurrency, Relation of Object and Dynamic Models.

Unit-III

Functional Models, Data flow diagrams, Specifying Operations, Constraints, OMT Methodologies, examples and case studies to demonstrate methodology

Unit-IV

Principles of object oriented programming, Tokens, Expressions, classes, Functions, Constructors, Destructors, Functions overloading, Operator Overloading, I/O Operations.
Real life applications, Inheritance Extended Classes, Pointer. Virtual functions, Polymorphisms, Working with files, Class templates, Function templates, Exception handling, String manipulation. Translating object oriented design into implementations.

Unit-V:

Introduction to Unix/Linux operating systems. Concept of file system, handling ordinary files, concept of shell, vi editor, Basic ile attributes, concept of process, Basic system administration.

Text Books:

1. Rambaugh James etal, "Object Oriented Design and Modeling",PHI-1997
2. Balagurusamy E," Object Oriented Programming with C++", TMH,2001 '
3. Sumitabha Das “Unix concepts & application” TMH

Reference Books:

1. Dillon and Lee, "Object Oriented Conceptual Modeling", New Delhi PHI-1993
2. Lipman, Stanley B, Jonsce Lajoie, *C++* Primer Reading", AWL, 1999
3. Stephen R. Shah, "Introduction to Object Oriented Analysis and Design", TMH
4. Berzin Joseph, "Data Abstraction: the object oriented approach using *C++"*, McGraw Hill
5. Budd, Timothy, "An Introduction to Object Oriented Programming", Pearson 2000

OPEN ELECTIVES- I

NOE-071: ENTREPRENEURSHIP DEVELOPMENT

L T P
3 1 0

UNIT -I

Entrepreneurship- definition. growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control:

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

Text / Reference Books:

1. Forbat, John, “Entrepreneurship” New Age International.
2. Havinal, Veerbhadrappa, “Management and Entrepreneurship” New Age International
3. Joseph, L. Massod, “Essential of Management", Prentice Hall of India.

NOE-072: QUALITY MANAGEMENT

L T P
3 1 0

UNIT-I

Quality Concepts:
Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product
Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality
Methods and techniques for manufacture, inspection and control of product, quality in sales and services, guarantee, analysis of claims.

UNIT-II

Quality Management
Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts
Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart
Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO-9000 and its concept of Quality Management
ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, “Total Quality Management”, Eastern Limited, 1990.
2. Greg Bounds, “Beyond Total Quality Management”, McGraw Hill, 1994.
3. Menon, H.G, “TQM in New Product manufacturing”, McGraw Hill 1992.

NOE-073: OPERATIONS RESEARCH

L T P
3 1 0

UNIT-I

Introduction:

Definition and scope of operations research (OR), OR model, solving the OR model, art of modelling, phases of OR study.

Linear Programming:

Two variable Linear Programaming model and Graphical method of solution, Simplex method, Dual Simplex method, special cases of Linear Programming, duality, senstivity analysis.

UNIT-II

Transportation Problems:

Types of transportation problems, mathemataical models , transportation algorithms,

Assignment:

Allocation and assignment problems and models, processing of job through machines.

UNIT-III

Network Techniques:

Shortest path model, minimum spanning Tree Problem, Max-Flow problem and Min-cost problem.

Project Management:

Phases of project management, guidelines for network construction, CPM and PERT.

UNIT-IV

Theory of Games :

Rectanagular games, Minimax theorem, graphical solution of 2 x n or m x 2 games, game with mixed strategies, reduction to linear programming model.

Quality Systems:

Elements of Queuing model, generalized poisson queing model, single server models.

UNIT-V

Inventory Control:

Models of inventory, operation of inventory system, quantity discount.

Replacement:

Replacement models: Equipments that deteriorate with time, equipments that fail with time.

Text / Reference Books:

1. Wayne L. Winston,"Operations Research" Thomson Learning,2003.
2. Hamdy H. Taha, "Operations Research-An Introduction" Pearson Education,2003.
3. R. Panneer Seevam, "Operations Research" PHI Learning, 2008.
4. V.K.Khanna, "Total Quality Management" New Age International, 2008.

NOE-074: INTRODUCTION TO BIOTECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction: Concept nature and scope of biotechnology.
Cell Structure and Function: Eukaryotic and prokaryotic cells, cell wall, membrane organization, cell organelles, Nucleus, Mitrochondria, endoplasmic reticulum, chloroplast, viruses and toxins into cells.
Cell Division: Mitosis and Meiosis.

UNIT-II

Biomolecules: A brief account of structure of carbohydrates, Lipids and Proteins.
Genes: Brief idea about Mendel's laws and chromosomes, nature of genetic materials, DN A and RNA, DNA replication.

UNIT-III

Gene Expression: Central dogma, genetic code, molecular mechanism on mutations, regulations of gene expression, house keeping genes, differentiation and development mutations and their molecular basic.
Genetic Engineering: Introduction, cloning (vectors and enzymes), DNA and genomic libraries, Transgenics, DNA fingerprinting, genomics.

UNIT-IV

Applications of Biotechnology: Bioprocess and fermentation technology, cell culture, Enzyme technology, biological fuel generation, sewage treatment, environmental biotechnology, biotechnology and medicine, biotechnology in agriculture, food and beverage technology, production of biological invention.

UNIT-V

Safety and Ethics: Safety, social, moral and ethic considerations, environmental ethics, bioethics and stem cell research, safety of new biotechnology foods, agro biodiversity and donor policies.

Text Books/ Reference Books:

1. Smith, "Biotechnology" Cambridge Press.
2. P.K. Gupta, "Elements of Biotechnology" Rastogi
3. H. D. Kumar, "Modern concepts of Biotechnology" Vikas publishing House.

NEE – 751: ELECTRIC DRIVES LAB

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0 0 3

Note: - Minimum 10 experiments are to be performed from the following out of which at least three should be simulation based.

(A) Hardware Based Experiments:

1. To study speed control of separately excited dc motor by varying armature voltage using single-phase fully controlled bridge converter.
2. To study speed control of separately excited dc motor by varying armature voltage using single phase half controlled bridge converter.
3. To study speed control of separately excited dc motor using single phase dual converter (Static Ward-Leonard Control)
4. To study speed control of separately excited dc motor using MOSFET/IGBT chopper
5. To study closed loop control of separately excited dc motor
6. To study speed control of single phase induction motor using single phase ac voltage controller.
7. To study speed control of three phase induction motor using three phase ac voltage controller
8. To study speed control of three phase induction motor using three phase current source inverter
9. To study speed control of three phase induction motor using three phase voltage source inverter
10. To study speed control of three phase slip ring induction motor using static rotor resistance control using rectifier and chopper
11. To study speed control of three phase slip ring induction motor using static scherbius slip power recovery control scheme

Simulation Based Experiments (using MATLAB or any other software)

12. To study starting transient response of separately excited dc motor
13. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.
14. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.
15. To study starting transient response of three phase induction motor
16. To study speed control of three phase induction motor using (a) constant/V/F control (b) Constant Voltage and frequency control.

NEC752B: ANALOG AND DIGITAL COMMUNICATION LAB

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Note: The minimum 10 experiments are to be performed from the following:

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal
4. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation. 12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television
16. Fabricate and test a PRBS generator
17. Realization of data in different forms, such as MRZ-L,NRZ - M&N,NRZ-S.
18. Manchester coding & decoding (Biphase L) of NRZ-L data.

NEE801: ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS

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UNIT – I
Crystal Structure of Materials:
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth
B. Energy bands in solids, classification of materials using energy band.

UNIT – II
Conductivity of Metals:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials, Properties and applications of electrical conducting and insulating materials, mechanical properties of metals

UNIT – III
Mechanism of Conduction in semiconductor materials:
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET, properties of semiconducting materials.

UNIT – IV
Magnetic Properties of Material:
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Antiferromagnetism and Ferrimagnetism, magnetostriction, properties of magnetic materials, soft and hard magnetic materials, permanent magnetic materials.

Text Books :
1 A.J. Dekker, "Electrical Engineering Materials" Prentice Hall of India
2 R.K. Rajput," Electrical Engg. Materials," Laxmi Publications.
3 C.S. Indulkar & S.Triruvagdan "An Introduction to Electrical Engg. Materials, S. Chand & Co.

References :
1 Solymar, "Electrical Properties of Materials" Oxford University Press.
2 Ian P. Hones," Material Science for Electrical and Electronic Engineering," Oxford University Press.
3 G.P. Chhalotra & B.K. Bhat, "Electrical Engineering Materials" Khanna Publishers.
4 T. K. Basak, "Electrical Engineering Materials" New age International.

NEE – 802: UTILIZATION OF ELECTRICAL ENERGY AND TRACTION

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3 1 0

Unit-I:
Electric Heating:
Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating

Unit-II:
Electric Welding:
Electric Arc Welding Electric Resistance welding Electronic welding control
Electrolyte Process:
Principles of electro deposition, Laws of electrolysis, applications of electrolysis

Unit-III
Illumination:
Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems
Refrigeration and Air Conditioning:
Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner

Unit-IV:
Electric Traction - I
Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

Unit-V:
Electric Traction – II
Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

Text Books:
1. H. Partab, “Art and Science of Electrical Energy” Dhanpat Rai & Sons.
2. G.K. Dubey, “Fundamentals of Electric Drives” Narosa Publishing House

Reference Books:
3. H. Partab, “ Modern Electric Traction” Dhanpat Rai & Sons.
4. C.L. Wadhwa, “ Generation, Distribution and Utilization of Electrical Energy” New Age International Publications.

NEE–041: EHV AC & DC TRANSMISSION

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3 1 0

UNIT-I:Introduction :
Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission

UNIT-II:EHV AC Transmission :
Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, ferroresonance, reduction of switching surges on EHV system, principle of half wave transmission.

UNIT-III:Extra High Voltage Testing:
Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers.
Consideration for Design of EHV Lines:
Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.

UNIT-IV:EHV DC Transmission – I:
Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters.
Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.

UNIT-V:EHV DC Transmission – II:
Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters,
Multi Terminal DC systems (MTDC): Types, control, protection and applications.

Text Books :
1.R. D. Begamudre, "Extra High Voltage AC Transmission Engineering" Wiley Eastern.
2.K. R. Padiyar, "HVDC Power Transmission Systems: Technology and System Reactions" New Age International.
3.J. Arrillaga," High Voltage Direct current Transmission" IFFE Power Engineering Series 6, Peter Peregrinus Ltd, London.
4.M. S. Naidu & V. Kamaraju, "High Voltage Engineering" Tata Mc Graw Hill.
Reference Books:
5.M. H. Rashid , " Power Electronics : Circuits, Devices and Applications" Prentice Hall of India.
6.S. Rao, "EHV AC and HVDC Transmission Engineering and Practice" Khanna Publisher.
7."EPRI, Transmission Line Reference Book, 345 KV and above" Electric Power Research Institute. Palo Alto, California, 1982.

NEE-042: POWER QUALITY

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Unit-I

Introduction to Power Quality:
Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions**;** Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset; waveform distortion; voltage fluctuation; power frequency variations**.**

Unit-II

Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.

Unit-III

Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.

Unit-IV

Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques.

Unit-V

Measurement and Solving of Power Quality Problems: Power quality measurement devices- Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc.
Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

Text Books:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices" Kluwer Academic Publishers
3. C. Sankaran, " Power Quality" CRC Press.

NEE-043/NEC-802: Embedded Systems

Unit-I
Introduction to embedded systems: Classification, Characteristics and requirements, Applications

Unit-II
Timing and clocks in Embedded systems, Task Modeling and management, Real time operating system issues.

Unit-III
Signals, frequency spectrum and sampling, digitization (ADC, DAC), Signal Conditioning and Processing.
Modeling and Characterization of Embedded Computation System.

Unit-IV
Embedded Control and Control Hierarchy, Communication strategies for embedded systems: Encoding and Flow control.

Unit-V
Fault-Tolerance, Formal Verification., Trends in Embedded Processor, OS, Development Language

References:

1. H.Kopetz, "Real-Time Systems", Kluwer
2. R.Gupta, "Co-synthesis of Hardware and Software for Embedded Systems", Kluwer
3. Shibu K.V., "Introduction to Embedded Systems", TMH
4. Marwedel, "Embedded System Design", Springer

NEE-044: SCADA

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UNIT I: SCADA:
Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierarchical Structure.
Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

UNIT II: Supervisory and Control Functions:
Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.
Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

UNIT III: MAN- Machine Communication:
Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

UNIT IV: Data basis- SCADA, EMS and network data basis.
SCADA system structure - local system, communication system and central system. Configuration-NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration.
Performance considerations: real time operation system requirements, modularization of software programming languages.

Text Books:
1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis",, Prentice Hall of India,
3. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
4. Sunil S Rao, "Switchgear Protection & Control System" Khanna Publishers 11th Edition.

OPEN ELECTIVES- II
NOE-081: NON-CONVENTIONAL ENERGY RESOURCES

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3 1 0

UNIT-I :Introduction : Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.
Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.

UNIT-II :Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III :Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.
Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV :Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
Wind Energy:
Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

UNIT-V :Bio-mass: Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave: Principle of working, performance and limitations.
Waste Recycling Plants.

Text/References Books:

1. Raja etal, “Introduction to Non-Conventional Energy Resources” Scitech Publications.
2. John Twideu and Tony Weir, “Renewal Energy Resources” BSP Publications, 2006.
3. M.V.R. Koteswara Rao, “ Energy Resources: Conventional & Non-Conventional “ BSP Publications,2006.
4. D.S. Chauhan,”Non-conventional Energy Resources” New Age International.
5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle,“ Renewable Energy Power For A Sustainable Future”, Oxford University Press.

NOE-082: NON-LINEAR DYNAMIC SYSTEMS

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UNIT-I

Dynamic systems:

Concept of dynamic systems, importance of non-linearity, nonlinear dynamics of flows (in 1, 2, and 3 dimensions) and Maps (1 and 2 dimensions) in phase space, Equilibrium, Periodicity.

Picard’s theorem, Peano’s theorem, boundedness of solutions, omega limit points of bounded trajectories.

UNIT-II

STABILITY-I:

Stability via Lyapunov’s indirect method, converse Lyapunov functions, sublevel sets of Lyapunow functions, Lasalle’s invariance principle.

UNIT-III

Stability-II

Lyapunov’s direct method, converse Lyapunov’s theorems, Brokett’s theorem, applications to control system, stable manifold theorem, centre manifold theorem, normal form theory and applications to nonlinear systems.

UNIT-IV

Bifurcation:

Elementary Bifurcation theory, catastrophe, strange attractor, fractals, fractal geometry and fractal dimension.

UNIT-V

Chaos:

Deterministic Chaos, routes to chaos (period doubling, quasiperiodicity, intermittency, universality, renormalization); Measurement of Chaos (Poincare section, Lyapunov index, entropy); control of chaos.

Reference Books:

1. D.K. Arrowsmith and C.M. Place, “An Introduction to Dynamical Systems” Cambridge University press, London, 1990.
2. K.T. Alligood, T.D. Sauer, and J.A Yorke, “CHAOS: An Introduction to Dynamical System” Springer Verlag, 1997.
3. H.K. Khalis, “Nonlinear Systems” Prentice Hall, 1996.
4. R. R. Mohler, “Non linear systems, Vol-I: Dynamics and Control” Prentice Hall, 1991.
5. J.M. T. Thomson and H.B. Stewart, “Nonlinear Dynamics and Chaos” John Wiley & Sons, 1986.
6. Stanislaw H. Zak, “Systems and control” Oxford University Press, 2003.

NOE-083 : DATABASE MANAGEMENT SYSTEM AND DATA MINING AND WAREHOUSING

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3 1 0

Unit-I: Introduction: An overview of database management system, database system v/s file system, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, data definitions language, DML, overall database structure.
Data modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, keys, concepts of super key, candidate key, primary key, generalization, aggregation, reduction of an ER diagrams to tables extended ER model, relationships of higher degree.

Unit-II: Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, keys constraints, domain constraints, relational algebra, relational calculus, tuple and domain calculus.
Introduction to SQL: Characteristics of SQL-Advantage of SQL data types and literals, types of SQL commands, SQL operators and their procedure tables, views and indexes, queries and sub queries, aggregate functions, insert, update and delete operations. Joins, Unions, Intersection, minus, cursors in SQL.

Unit-III: Data Base Design & Normalization: Functional dependencies, normal forms, first, second and third normal forms, BCNF, inclusion dependences, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit-IV: Foundation. Introduction to DATA Warehousing. Client / Server Computing model & Data Warehousing. Parallel processors & System. Distributed DBMS implementations. Client /Server RDBMS Solutions.

Unit-V: DATA Warehousing. Data Warehousing Components. Building a Data Warehouse. Mapping the Data Warehouse to a Multiprocessor Architecture. DBMS Schemas for Decision Support. Data Extraction, cleanup & Transformation Tools. Metadata.
Data Mining: Introduction to data mining

Text Books:
1. Korth, Silbertz, Sudarshan, Database Concepts., Mc Graw Hill
2. Date C.J., An Introduction To Database System., Addition Wesley
3. Alex Berson & Stephen J. Smith, Data Warehousing, Data Mining & OLAP., Tata Mc.Graw Hill.
4. Mallach, Data Warehousing System., Mc. Graw Hill

Reference Books :
1. Elmasri, Navathe, Fundamentals of Database Systems., Addition Wesley
2. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publication
3. Majumdar & Bhattacharya, Database Management System., Tata Mc Graw Hill
4. Ramakrishnan, Gehrke, Database Management System., Mc Graw Hill.

NOE-084: AUTOMATION AND ROBOTICS

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1. **Introduction:** Definition, Classification of Robots, geometric classification and control classification.
2. **Robot Elements:** Drive system, control system, sensors, end effectors, gripper actuators and gripper design.
3. **Robot Coordinate Systems and Manipulator Kinematics:** Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

   Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.
4. **Robot Control:** Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.
5. **Robot Programming:** Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.
6. **Applications:** Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. Coifet Chirroza, “An Introduction to Robot Technology” Kogan Page.
2. Y. Koren “Robotics for Engineers” Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, “Robotics” McGraw Hill.
4. J.J. Craig, “Robotics” Addison-Wesley.
5. Grover, Mitchell Weiss, Nagel Octrey, “Industrial Robots” Mcgraw Hill.
6. Asfahl, “Robots & Manufacturing Automation” Wily Eastern.