B.E. ELECTRONICS AND COMMUNICATION ENGINEERING

(Regulation -2013)

CORE COURSES

S.NO	SEMESTER	COURSE CODE	COURSE TITLE
1.	1	HS6151	TECHNICAL ENGLISH – I
2.		MA6151	MATHEMATICS – I
3.		PH6151	ENGINEERING PHYSICS – I
4.		CY6151	ENGINEERING CHEMISTRY – I
5.		GE6151	COMPUTER PROGRAMMING
6.		GE6152	ENGINEERING GRAPHICS
7.		GE6161	COMPUTER PROGRAMMING LABORATORY
8.		GE6162	ENGINEERING PRACTICES LABORATORY
9.		GE6163	PHYSICS AND CHEMISTRY LABORATORY - I
10.	2	HS6251	TECHNICAL ENGLISH – II
11.		MA6251	MATHEMATICS – II
12.		PH6251	ENGINEERING PHYSICS – II
13.		CY6251	ENGINEERING CHEMISTRY – II
14.		EC6201	ELECTRONIC DEVICES
15.		EE6201	CIRCUIT THEORY
16.		GE6262	PHYSICS AND CHEMISTRY LABORATORY - II
17.		EC6211	CIRCUITS AND DEVICES LABORATORY
18.	3	MA6351	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS
19.		EE6352	ELECTRICAL ENGINEERING AND INSTRUMENTATION
20.		EC6301	OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES
21.		EC6302	DIGITAL ELECTRONICS
22.		EC6303	SIGNALS AND SYSTEMS
23.		EC6304	ELECTRONIC CIRCUITS – I
24.		EC6311	ANALOG AND DIGITAL CIRCUITS LABORATORY
25.		EC6312	OOPS AND DATA STRUCTURES LABORATORY
26.		MA6451	PROBABILITY AND RANDOM PROCESSES

27.		EC6401	ELECTRONIC CIRCUITS II
28.		EC6402	COMMUNICATION THEORY
29.		EC6403	ELECTROMAGNETIC FIELDS
30.	4	EC6404	LINEAR INTEGRATED CIRCUITS
31.		EC6405	CONTROL SYSTEM ENGINEERING
32.		EC6411	CIRCUIT AND SIMULATION INTEGRATED LABORATORY
33.		EC6412	LINEAR INTEGRATED CIRCUIT LABORATORY
34.		EE6461	ELECTRICAL ENGINEERING AND CONTROL SYSTEM LABORATORY
35.		EC6501	DIGITAL COMMUNICATION
36.		EC6502	PRINCIPLES OF DIGITAL SIGNAL PROCESSING
37.		EC6503	TRANSMISSION LINES AND WAVE GUIDES
38.		GE6351	ENVIRONMENTAL SCIENCE AND ENGINEERING
39.	5	EC6504	MICROPROCESSOR AND MICROCONTROLLER
40.		EC6511	DIGITAL SIGNAL PROCESSING LABORATORY
41.		EC6512	COMMUNICATION SYSTEM LABORATORY
42.		EC6513	MICROPROCESSOR AND MICROCONTROLLER LABORATORY
43.		MG6851	PRINCIPLES OF MANAGEMENT
44.		CS6303	COMPUTER ARCHITECTURE
45.		CS6551	COMPUTER NETWORKS
46.	6	EC6601	VLSI DESIGN
47.		EC6602	ANTENNA AND WAVE PROPAGATION
48.		EC6611	COMPUTER NETWORKS LABORATORY
49.		EC6612	VLSI DESIGN LABORATORY
50.		GE6674	COMMUNICATION AND SOFT SKILLS – LABORATORY BASED
51.		EC6701	RF AND MICROWAVE ENGINEERING
52.	7	EC6702	OPTICAL COMMUNICATION AND NETWORKS
53.		EC6703	EMBEDDED AND REAL TIME SYSTEMS
54.		EC6711	EMBEDDED LABORATORY
55.		EC6712	OPTICAL AND MICROWAVE LABORATORY
56.	8	EC6801	WIRELESS COMMUNICATION
57.		EC6802	WIRELESS NETWORKS
58.		EC6811	PROJECT WORK

CORE SUBJECTS

SEMESTER -1

HS6151   **TECHNICAL ENGLISH – I**   **L T P C**
           3 1 0 4

UNIT I   **9+3**
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one"s place, important festivals etc. – Introducing oneself, one"s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one"s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II   **9+3**
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Process descriptions (general/specific) - Definitions - Recommendations – Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities

UNIT III   **9+3**
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV   **9+3**
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V   **9+3**
Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email; Writing - Creative writing,

Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

TOTAL (L: 45+T: 15): 60 PERIODS

TEXTBOOKS:

1. Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai. 2011

REFERENCES:

1. Raman, Meenakshi & Sangeetha Sharma. Technical Communication: Principles and Practice. Oxford University Press, New Delhi. 2011
2. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006
3. Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi. 2005
4. Rutherford, Andrea. J Basic Communication Skills for Technology. Pearson, New Delhi. 2001
5. Viswamohan, Aysha. English for Technical Communication. Tata McGraw-Hill, New Delhi. 2008

EXTENSIVE Reading (Not for Examination)
1. Kalam, Abdul. Wings of Fire. Universities Press, Hyderabad. 1999.

WEBSITES:
1. http://www.usingenglish.com
2. http://www.uefap.com

MA6151   **MATHEMATICS – I**   **L T P C**
                                                        3 1 0 4

UNIT I   **MATRICES**   **9+3**
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II   **SEQUENCES AND SERIES**   **9+3**
Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D"Alembert"s ratio test – Alternating series – Leibnitz"s test – Series of positive and negative terms – Absolute and conditional convergence.

UNIT III   **APPLICATIONS OF DIFFERENTIAL CALCULUS**   **9+3**
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV   DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES   9+3
Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions
– Jacobian and properties – Taylor"s series for functions of two variables – Maxima and minima
of functions of two variables – Lagrange"s method of undetermined multipliers.

UNIT V   MULTIPLE INTEGRALS   9+3
Double integrals in cartesian and polar coordinates – Change of order of integration – Area
enclosed by plane curves – Change of variables in double integrals – Area of a curved surface -
Triple integrals – Volume of Solids.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi
Publications Pvt Ltd., 2011.
2. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi,
2011.

REFERENCES:

1 Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd.,
2011.
2 Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education,
2012.
3 Peter V. O"Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning, (2012).
4 Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New
Delhi, 2008.
5 Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics", Volume I,
Second Edition, PEARSON Publishing, 2011.

PH6151   ENGINEERING PHYSICS – I   L T P C
**   3 0 0 3**

UNIT I   CRYSTAL PHYSICS   9
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice –
Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing
factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative
treatment)-Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour
growth techniques (qualitative)

UNIT II   PROPERTIES OF MATTER AND THERMAL PHYSICS   9

Elasticity- Hooke"s law - Relationship between three modulii of elasticity (qualitative) – stress -
strain diagram – Poisson"s ratio –Factors affecting elasticity –Bending moment – Depression of
a cantilever–Young"s modulus by uniform bending- I-shaped girders Modes of heat transfer-
thermal conductivity- Newton"s law of cooling - Linear heat flow – Lee"s disc method – Radial
heat flow – Rubber tube method – conduction through compound media (series and parallel)

UNIT III   QUANTUM PHYSICS   9
Black body radiation – Planck"s theory (derivation) – Deduction of Wien"s displacement law and
Rayleigh – Jeans" Law from Planck"s theory – Compton effect. Theory and experimental
verification – Properties of Matter waves – G.P Thomson experiment -Schrödinger"s wave

equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT IV   ACOUSTICS AND ULTRASONICS   9
Classification of Sound- decibel- Weber–Fechner law – Sabine‟s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C –scan displays, Medical applications – Sonogram

UNIT V   PHOTONICS AND FIBRE OPTICS   9
Spontaneous and stimulated emission- Population inversion -Einstein‟s A and B coefficients - derivation. Types of lasers – Nd:YAG, CO_2 , Semiconductor lasers (homojunction & heterojunction)-Industrial and Medical Applications. Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Arumugam M. Engineering Physics. Anuradha publishers, 2010.
2. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai publishers, 2009
3. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing, 2011.

REFERENCES:

1. Searls and Zemansky. University Physics, 2009
2. Mani P. Engineering Physics I. Dhanam Publications, 2011.
3. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009.
4. Palanisamy P.K. Engineering Physics. SCITECH Publications, 2011.
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011.
6. Senthilkumar G. Engineering Physics I. VRB Publishers, 2011.

CY6151   ENGINEERING CHEMISTRY - I   L T P C
**   3 0 0 3**

UNIT I   POLYMER CHEMISTRY   9
Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II   CHEMICAL THERMODYNAMICS   9
Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of

spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van"t Hoff isotherm and isochore(problems).

UNIT III   PHOTOCHEMISTRY AND SPECTROSCOPY   9
Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination- Photo processes - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only).

UNIT IV   PHASE RULE AND ALLOYS   9
Phase rule: Introduction, definition of terms with examples, One Component System- water system - Reduced phase rule - Two Component Systems- classification – lead-silver system, zinc-magnesium system. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.

UNIT V   NANOCHEMISTRY   9
Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications

TOTAL :45 PERIODS

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010
2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009.

REFERENCES:

1. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Gowariker V.R. , Viswanathan N.V. and JayadevSreedhar, "Polymer Science", New Age
4. International P (Ltd.,), Chennai, 2006.
5. Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.

**GE6151   COMPUTER PROGRAMMING   L T P C
                                                                 3 0 0 3**

UNIT I   INTRODUCTION   8
Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II   C PROGRAMMING BASICS   10
Problem formulation – Problem Solving - Introduction to „ C" programming –fundamentals – structure of a „C" program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in „C" – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III   ARRAYS AND STRINGS   9
Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV   FUNCTIONS AND POINTERS   9
Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V   STRUCTURES AND UNIONS   9
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling indersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.
2. Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009
3. Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.

REFERENCES:

1. Byron S Gottfried, "Programming with C", Schaum"s Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.
3. Kernighan,B.W and Ritchie,D.M, "The C Programming language", Second Edition, Pearson Education, 2006.

GE6152   ENGINEERING GRAPHICS   L T P C
2 0 3 4

CONCEPTS AND CONVENTIONS (Not for Examination)   1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I   PLANE CURVES AND FREE HAND SKETCHING   5+9
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACES   5+ 9

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III   PROJECTION OF SOLIDS   5 + 9

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV   PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES   5+9

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V   ISOMETRIC AND PERSPECTIVE PROJECTIONS   6 + 9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

COMPUTER AIDED DRAFTING (Demonstration Only)   3

Introduction to drafting packages and demonstration of their use.

TOTAL: 75 PERIODS

TEXT BOOK:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.

REFERENCES:

1. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
3. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
6. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

GE6161   **COMPUTER PRACTICES LABORATORY**   **L T P C**
                                                                              0 0 3 2

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

                                                            TOTAL: 45 PERIODS

GE6162   **ENGINEERING PRACTICES LABORATORY**   **L T P C**
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                          GROUP A (CIVIL & MECHANICAL)

I   CIVIL ENGINEERING PRACTICE   **9**

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II   MECHANICAL ENGINEERING PRACTICE   **13**

Welding:
(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:
(a) Simple Turning and Taper turning   (b) Drilling Practice

Sheet Metal Work:
(a) Forming & Bending: (b) Model making – Trays, funnels, etc. (c) Different type of joints.
Machine assembly practice:
(a) Study of centrifugal pump   (b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III   ELECTRICAL ENGINEERING PRACTICE   10

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IV   ELECTRONICS ENGINEERING PRACTICE   13

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

GE6163   **PHYSICS AND CHEMISTRY LABORATORY – I**   **L T P C**
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PHYSICS LABORATORY – I

LIST OF EXPERIMENTS
1 (a) Determination of Wavelength, and particle size using Laser (b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
4. Determination of thermal conductivity of a bad conductor – Lee"s Disc method.
5. Determination of Young"s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster"s Bridge

CHEMISTRY LABORATORY – I
LIST OF EXPERIMENTS
1. Determination of DO content of water sample by Winkler"s method.
2. Determination of chloride content of water sample by argentometric method
3. Determination of strength of given hydrochloric acid using pH meter
4. Determination of strength of acids in a mixture using conductivity meter

5. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method)
6. Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
7. Conductometric titration of strong acid vs strong base

REFERENCES:

1. Daniel R. Palleros, "Experimental organic chemistry" John Wiley & Sons, Inc., New Yor (2001).
2. Furniss B.S. Hannaford A.J, Smith P.W.G and Tatchel A.R., "Vogel"s Textbook of practical organic chemistry", LBS Singapore (1994).
3. Jeffery G.H., Bassett J., Mendham J.and Denny vogel"s R.C, "Text book of quantitative analysis chemical analysis", ELBS 5th Edn. Longman, Singapore publishers, Singapore, 1996.
4. Kolthoff I.M., Sandell E.B. et al. "Quantitative chemical analysis", Mcmillan, Madras 1980

SEMESTER – 2

HS6251   **TECHNICAL ENGLISH II**   **L T P C**
                                                            3 1 0 4

UNIT I   **9+3**
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using „emoticons" as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. „can") - Homophones (e.g. „some", „sum"); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II   **9+3**
Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one"s friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, Extensive reading activity (reading stories / novels), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students" dialogues.

UNIT III   **9+3**
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format

and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. „rock", „train", „ring"); E-materials - Interactive exercise on Grammar and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials– Attending a meeting and writing minutes.

UNIT IV   **9+3**
Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V   **9+3**
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

TOTAL (L: 45+T: 15): 60 PERIODS

TEXTBOOKS:

1. Department of English, Anna University. Mindscapes: English for Technologists and Engineers. Orient Blackswan, Chennai. 2012
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering. Orient Blackswan, Chennai. 2011

REFERENCES:

1. Anderson, Paul V. Technical Communication: A Reader-Centered Approach. Cengage. New Delhi. 2008
2. Muralikrishna, & Sunita Mishra. Communication Skills for Engineers. Pearson, New Delhi. 2011
3. Riordan, Daniel. G. Technical Communication. Cengage Learning, New Delhi. 2005
4. Sharma, Sangeetha & Binod Mishra. Communication Skills for Engineers and Scientists. PHI Learning, New Delhi. 2009
5. Smith-Worthington, Darlene & Sue Jefferson. Technical Writing for Success. Cengage, Mason USA. 2007

EXTENSIVE Reading (Not for Examination)

1. Khera, Shiv. You can Win. Macmillan, Delhi. 1998.

Websites:

1. http://www.englishclub.com
2. http://owl.english.purdue.edu

MA6251   MATHEMATICS – II   **L T P C**
                                                                3 1 0 4

UNIT I   VECTOR CALCULUS   9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green‟s theorem in a plane, Gauss divergence theorem and Stokes‟ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II   ORDINARY DIFFERENTIAL EQUATIONS   9+3
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy‟s and Legendre‟s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III   LAPLACE TRANSFORM   9+3
Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform -Statement of Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV   ANALYTIC FUNCTIONS   9+3
Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z+k, kz, 1/z, z^2, e^z$ and bilinear transformation.

UNIT V   COMPLEX INTEGRATION   9+3
Complex integration – Statement and applications of Cauchy‟s integral theorem and Cauchy‟s integral formula – Taylor‟s and Laurent‟s series expansions – Singular points – Residues – Cauchy‟s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL (L: 45+T:15): 60 PERIODS

TEXT BOOKS:

1. Bali N. P and Manish Goyal, "A Text book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd.,2011.
2. Grewal. B.S, "Higher Engineering Mathematics", 41st Edition, Khanna Publications, Delhi, 2011.

REFERENCES:

1. Dass, H.K., and Er. Rajnish Verma," Higher Engineering Mathematics", S. Chand Private Ltd., 2011
2. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2012.
3. Peter V. O"Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning, 2012.
4. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi, 2008.
5. Sivarama Krishna Das P. and Rukmangadachari E., "Engineering Mathematics" Volume II,
6. Second Edition, PEARSON Publishing 2011.

PH6251   **ENGINEERING PHYSICS – II**   **L T P C**
                                                                    3 0 0 3.

UNIT I   CONDUCTING MATERIALS   9
Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II   SEMICONDUCTING MATERIALS   9
Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration —— Hall effect –Determination of Hall coefficient – Applications.

UNIT III   MAGNETIC AND SUPERCONDUCTING MATERIALS   9
Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation..

UNIT IV   DIELECTRIC MATERIALS   9
Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V   ADVANCEDS ENGINEERING MATERIALS   9
Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications

                                                        TOTAL: 45 PERIODS

TEXT BOOKS:

1. Arumugam M., Materials Science. Anuradha publishers, 2010
2. Pillai S.O., Solid State Physics. New Age International(P) Ltd., publishers, 2009

REFERENCES:

1. Palanisamy P.K. Materials Science. SCITECH Publishers, 2011
2. Senthilkumar G. Engineering Physics II. VRB Publishers, 2011
3. Mani P. Engineering Physics II. Dhanam Publications, 2011
4. Marikani A. Engineering Physics. PHI Learning Pvt., India, 2009

CY6251   ENGINEERING CHEMISTRY-II   **L T P C**
                                                                      3 0 0 3

UNIT I   WATER TECHNOLOGY   9
Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement-boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

UNIT II   ELECTROCHEMISTRY AND CORROSION   9
Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types- chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroplating of Copper and electroless plating of nickel.

UNIT III   ENERGY SOURCES   9
Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator-classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery-nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell- applications.

UNIT IV   ENGINEERING MATERIALS   9
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement-waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V   FUELS AND COMBUSTION   9
Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal-analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking-

octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas. Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio-ignition temperature- explosive range - flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Vairam S, Kalyani P and SubaRamesh.,"Engineering Chemistry"., Wiley India Pvt Ltd.,New Delhi., 2011
2. Dara S.S and Umare S.S. "Engineering Chemistry", S. Chand & Company Ltd., New Delhi , 2010

REFERENCES:

1. Kannan P. and Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009
2. AshimaSrivastava and Janhavi N N., "Concepts of Engineering Chemistry", ACME Learning
3. Private Limited., New Delhi., 2010.
4. RenuBapna and Renu Gupta., "Engineering Chemistry", Macmillan India Publisher Ltd., 2010.
5. Pahari A and Chauhan B., "Engineering Chemistry"., Firewall Media., New Delhi., 2010

EC6201   **ELECTRONIC DEVICES**   **L T P C**
                                                                         3 0 0 3

UNIT I   SEMICONDUCTOR DIODE   9
 PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics.

UNIT II   BIPOLAR JUNCTION   9
NPN -PNP -Junctions-Early effect-Current equations – Input and Output characteristics of CE, CB CC-Hybrid -π model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transistor.

UNIT III   FIELD EFFECT TRANSISTORS   9
JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET-,Current equation - Equivalent circuit model and its parameters, FINFET,DUAL GATE MOSFET.

UNIT IV   SPECIAL SEMICONDUCTOR DEVICES   9
Metal-Semiconductor Junction- MESFET, Schottky barrier diode-Zener diode-Varactor diode – Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V   POWER DEVICES AND DISPLAY DEVICES   9
UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Photo
transistor, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Donald A Neaman, "Semiconductor Physics and Devices", Third Edition, Tata Mc GrawHill
Inc. 2007.

REFERENCES:

1. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.
2. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson
Prentice Hall, 10th edition,July 2008.

EE6201   CIRCUIT THEORY   L T P C
**   3 1 0 4**

UNIT I   BASIC CIRCUITS ANALYSIS   12
 Ohm"s Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits –
Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram
– Power, Power Factor and Energy

UNIT II   NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC
**   CIRCUITS   12**
Network reduction: voltage and current division, source transformation – star delta conversion.
Thevenins and Norton & Theorem – Superposition Theorem – Maximum power transfer
theorem – Reciprocity Theorem.

UNIT III   RESONANCE AND COUPLED CIRCUITS   12
Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self
and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT IV   TRANSIENT RESPONSE FOR DC CIRCUITS   12
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C.
with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

UNIT V   THREE PHASE CIRCUITS   12
Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-
wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of
voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum"s series, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES:

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, 1996.
2. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, 2007.
3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
4. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.

EC6211   CIRCUITS AND DEVICES LABORATORY   **L T P C**
                                                                                 0 0 3 2
LIST OF EXPERIMENTS:
1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem
12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

                                                                    TOTAL: 45 PERIODS

 GE6262   PHYSICS AND CHEMISTRY LABORATORY – II   L T P C
                                                                     0 0 2 1
                          PHYSICS LABORATORY – II
LIST OF EXPERIMENTS:

   1. Determination of Young"s modulus by uniform bending method
   2. Determination of band gap of a semiconductor
   3. Determination of Coefficient of viscosity of a liquid –Poiseuille"s method
   4. Determination of Dispersive power of a prism - Spectrometer
   5. Determination of thickness of a thin wire – Air wedge method
   6. Determination of Rigidity modulus – Torsion pendulum

CHEMISTRY LABORATORY –II
LIST OF EXPERIMENTS:

1. Determination of alkalinity in water sample
2. Determination of total, temporary & permanent hardness of water by EDTA method
3. Estimation of copper content of the given solution by EDTA method
4. Estimation of iron content of the given solution using potentiometer
5. Estimation of sodium present in water using flame photometer
6. Corrosion experiment – weight loss method
7. Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
8. Determination of CaO in Cement.

TOTAL : 30 PERIODS

SEMESTER -3

MA6351   TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS   **L T P C**
                                                                   3 1 0 4

UNIT I   PARTIAL DIFFERENTIAL EQUATIONS   9+3
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange"s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II   FOURIER SERIES   9+3
Dirichlet"s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval"s identity – Harmonic analysis.

UNIT III   APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS   9+3
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV   FOURIER TRANSFORMS   9+3
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval"s identity.

UNIT V   Z - TRANSFORMS AND DIFFERENCE EQUATIONS   9+3
Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:

1. Veerarajan. T., "Transforms and Partial Differential Equations", Second reprint, Tata Mc Graw Hill Education Pvt. Ltd., New Delhi, 2012.

2. Grewal. B.S., "Higher Engineering Mathematics", 42nd Edition, Khanna Publishers, Delhi, 2012.
3. Narayanan.S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students" Vol. II & III, S.Viswanathan Publishers Pvt Ltd. 1998.

REFERENCES:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 7th Edition, Laxmi Publications Pvt Ltd , 2007.
2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-Graw Hill Publishing Company Limited, New Delhi, 2008.
3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education, 2007.
4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th Edition, Wiley India, 2007.
5. Ray Wylie. C and Barrett.L.C, "Advanced Engineering Mathematics" Sixth Edition, Tata Mc Graw Hill Education Pvt Ltd, New Delhi, 2012.
6. Datta.K.B., "Mathematical Methods of Science and Engineering", Cengage Learning India Pvt Ltd, Delhi, 2013.

EE6352   ELECTRICAL ENGINEERING AND INSTRUMENTATION   L T P C
3 1 0 4

UNIT I   DC MACHINES   9
Three phase circuits, a review. Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators- Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors- Applications.

UNIT II   TRANSFORMER   9
Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer-Transformer no–load phasor diagram –– Transformer on–load phasor diagram – – Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT III   INDUCTION MACHINES AND SYNCHRONOUS MACHINES   9
Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit –Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

UNIT IV   BASICS OF MEASUREMENT AND INSTRUMENTATION   9
Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive – Strainguage, thermistor RTD – transducer - Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer – LVDT, RVDT

UNIT V   ANALOG AND DIGITAL INSTRUMENTS   9

DVM, DMM – Storage Oscilloscope. Comparison of Analog and Digital Modes of operation, Application of measurement system, Errors. Measurement of R, L and C, Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges Measurement of Inductance, Capacitance, Effective resistance at high frequency, Q-Meter.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:

1. I.J Nagarath and Kothari DP, "Electrical Machines", McGraw-Hill Education (India) Pvt Ltd 4th Edition ,2010
2. A.K.Sawhney, "A Course in Electrical & Electronic Measurements and Instrumentation", Dhanpat Rai and Co, 2004.

REFERENCES:

1. Del Toro, "Electrical Engineering Fundamentals" Pearson Education, New Delhi, 2007.
2. W.D.Cooper & A.D.Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.
3. John Bird, "Electrical Circuit Theory and Technology", Elsevier, First Indian Edition, 2006.
4. Thereja .B.L, "Fundamentals of Electrical Engineering and Electronics", S Chand & Co Ltd, 2008.
5. H.S.Kalsi, "Electronic Instrumentation", Tata Mc Graw-Hill Education, 2004.
6. J.B.Gupta, "Measurements and Instrumentation", S K Kataria & Sons, Delhi, 2003.

EC6301   OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES   L T P C
0 0 3 3

UNIT I   DATA ABSTRACTION & OVERLOADING   9
Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

UNIT II   INHERITANCE & POLYMORPHISM   9
Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT III   LINEAR DATA STRUCTURES   10
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation –– singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

UNIT IV   NON-LINEAR DATA STRUCTURES   9

Trees – Binary Trees – Binary tree representation and traversals – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

UNIT V   SORTING and SEARCHING   8

Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search –Binary Search

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Deitel and Deitel, "C++, How To Program", Fifth Edition, Pearson Education, 2005.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Third Edition, Addison-Wesley, 2007.

REFERENCES:

1. Bhushan Trivedi, "Programming with ANSI C++, A Step-By-Step approach", Oxford University Press, 2010.
2. Goodrich, Michael T., Roberto Tamassia, David Mount, "Data Structures and Algorithms in C++", 7th Edition, Wiley. 2004.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Second Edition, Mc Graw Hill, 2002.
4. Bjarne Stroustrup, "The C++ Programming Language", 3rd Edition, Pearson Education, 2007.
5. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C++", Galgotia Publications, 2007.

EC6302   DIGITAL ELECTRONICS   L T P C
3 0 0 3

UNIT I   MINIMIZATION TECHNIQUES AND LOGIC GATES   9

Minimization Techniques: Boolean postulates and laws – De-Morgan"s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don"t care conditions – Quine - Mc Cluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II   COMBINATIONAL CIRCUITS   9

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III   SEQUENTIAL CIRCUITS   9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation – Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization – State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV   MEMORY DEVICES   9

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL.

UNIT V   SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS   9

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits.
Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG.

TOTAL: 45 PERIODS

TEXT BOOK:
1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.

REFERENCES:

1. John F.Wakerly, "Digital Design", Fourth Edition, Pearson/PHI, 2008
2. John.M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.
3. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
4. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2006.
5. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011
6. Donald D.Givone, "Digital Principles and Design", TMH, 2003.

EC6303   SIGNALS AND SYSTEMS   L T P C
**   3 1 0 4**

UNIT I   CLASSIFICATION OF SIGNALS AND SYSTEMS   9

Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic

signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems- Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.

UNIT II   ANALYSIS OF CONTINUOUS TIME SIGNALS   9
 Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

 UNIT III   LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS   9
Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems

UNIT IV   ANALYSIS OF DISCRETE TIME SIGNALS   9
 Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform

UNIT V   LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS   9
Difference Equations-Block diagram representation-Impulse response - Convolution sum-Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2007.

REFERENCES:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.
4. M.J.Roberts, "Signals & Systems Analysis using Transform Methods & MATLAB", Tata McGraw Hill, 2007.

EC6304   ELECTRONIC CIRCUITS – I   L T P C
3 1 0 4

UNIT I   POWER SUPPLIES AND BIASING OF DISCRETE BJT AND MOSFET   9
Rectifiers with filters- DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET

UNIT II   BJT AMPLIFIERS   9
Small signal Analysis of Common Emitter-AC Load line, Voltage swing limitations, Common collector and common base amplifiers – Differential amplifiers- CMRR- Darlington Amplifier-Bootstrap technique - Cascaded stages - Cascode Amplifier-Large signal Amplifiers – Class A , Class B and Class C Power Amplifiers .

UNIT III   JFET AND MOSFET AMPLIFIERS   9
Small signal analysis of JFET amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiMOS Cascode amplifier.

UNIT IV   FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS   9
Low frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage and multistage amplifiers

UNIT V   IC MOSFET AMPLIFIERS   9
IC Amplifiers- IC biasing Current steering circuit using MOSFET- MOSFET current sources-PMOS and NMOS current sources. Amplifier with active loads - enhancement load, Depletion load and PMOS and NMOS current sources load- CMOS common source and source follower-CMOS differential amplifier- CMRR.

TOTAL (L: 45+T: 15): 60 PERIODS

TEXT BOOK:
1. Donald .A. Neamen, Electronic Circuit Analysis and Design –2nd Edition,Tata Mc Graw Hill, 2009.

REFERENCES:
1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010.
2. David A., "Bell Electronic Devices and Circuits", Oxford Higher Education Press, 5th Edition, 2010
3. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata Mc Graw Hill, 2007.
4. Paul Gray, Hurst, Lewis, Meyer "Analysis and Design of Analog Integrated Circuits", 4th Edition ,John Willey & Sons 2005
5. Millman.J. and Halkias C.C, "Integrated Electronics", Mc Graw Hill, 2001.
6. D.Schilling and C.Belove, "Electronic Circuits", 3rd Edition, Mc Graw Hill, 1989.
7. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008.

EC6311   ANALOG AND DIGITAL CIRCUITS LABORATORY   L T P C
                                                                    0 0 3 2
LIST OF EXPERIMENTS LIST OF ANALOG EXPERIMENTS:
1. Frequency Response of CE / CB / CC amplifier
2. Frequency response of CS Amplifiers
3. Darlington Amplifier
4. Differential Amplifiers- Transfer characteristic.
5. CMRR Measurment
6. Cascode / Cascade amplifier
7. Determination of bandwidth of single stage and multistage amplifiers
8. Spice Simulation of Common Emitter and Common Source amplifiers

LIST OF DIGITAL EXPERIMENTS
9. Design and implementation of code converters using logic gates

(i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
10. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483

11. Design and implementation of Multiplexer and De-multiplexer using logic gates
12. Design and implementation of encoder and decoder using logic gates
13. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
14. Design and implementation of 3-bit synchronous up/down counter
15. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops

TOTAL: 45 PERIODS

EC6312   OOPS AND DATA STRUCTURES LABORATORY   L T P C
0 0 3 2

LIST OF EXPERIMENTS:
1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files
i. Program source files for Stack Application 1
ii. Array implementation of Stack ADT
iii. Linked list implementation of Stack ADT
iv. Program source files for Stack Application 2
v. An appropriate header file for the Stack ADT should be included in (i) and (iv)
7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files
(iv) and (iii))
11. Queue ADT – Array and linked list implementations
12. Search Tree ADT - Binary Search Tree
13. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.
14. Quick Sort

TOTAL: 45 PERIODS

MA6451   **PROBABILITY AND RANDOM PROCESSES**   **L T P C**
                                                                       3 1 0 4

UNIT I   **RANDOM VARIABLES**   **9+3**
Discrete and continuous random variables – Moments – Moment generating functions –
Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II   **TWO - DIMENSIONAL RANDOM VARIABLES**   **9+3**
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear
regression – Transformation of random variables.

UNIT III   **RANDOM PROCESSES**   **9+3**
Classification – Stationary process – Markov process - Poisson process – Random telegraph
process.

UNIT IV   **CORRELATION AND SPECTRAL DENSITIES**   **9+3**
Auto correlation functions – Cross correlation functions – Properties – Power spectral density –
Cross spectral density – Properties.

UNIT V   **LINEAR SYSTEMS WITH RANDOM INPUTS**   **9+3**
Linear time invariant system – System transfer function – Linear systems with random inputs –
Auto correlation and Cross correlation functions of input and output.

                                        TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:

1. Ibe.O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian
Reprint, 2007.
2. Peebles. P.Z., "Probability, Random Variables and Random Signal Principles", Tata Mc Graw
Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Yates. R.D. and Goodman. D.J., "Probability and Stochastic Processes", 2nd Edition, Wiley
India Pvt. Ltd., Bangalore, 2012.
2. Stark. H., and Woods. J.W., "Probability and Random Processes with Applications to Signal
Processing", 3rd Edition,Pearson Education, Asia, 2002.
3. Miller. S.L. and Childers. D.G., "Probability and Random Processes with Applications to
Signal Processing and Communications", Academic Press, 2004.
4. Hwei Hsu, "Schaum"s Outline of Theory and Problems of Probability, Random Variables and
Random Processes", Tata Mc Graw Hill Edition, New Delhi, 2004.
5. Cooper. G.R., Mc Gillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd
Indian Edition, Oxford University Press, New Delhi, 2012.

EC6401   **ELECTRONIC CIRCUITS II**   **L T P C**
         3 0 0 3

UNIT I   FEEDBACK AMPLIFIERS   9
General Feedback Structure – Properties of negative feedback – Basic Feedback Topologies – Feedback amplifiers – Series – Shunt, Series – Series, Shunt – Shunt and Shunt – Series Feedback – Determining the Loop Gain – Stability Problem – Nyquist Plot – Effect of feedback on amplifier poles – Frequency Compensation.

UNIT II   OSCILLATORS   9
Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators - Hartley, Colpitts,Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators - phase shift –Wienbridge - Twin-T Oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT III   TUNED AMPLIFIERS   9
Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers – large signal tuned amplifiers – Class C tuned amplifier – Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

UNIT IV   WAVE SHAPING AND MULTIVIBRATOR CIRCUITS   9
RC & RL Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capaitor - Diode clippers, Diode comparator - Clampers. Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator - Bistable multivibrators - Triggering methods for Bigtable multivibrators - Schmitt trigger circuit.

UNIT V   BLOCKING OSCILLATORS AND TIMEBASE GENERATORS   9
UJT saw tooth waveform generator, Pulse transformers – equivalent circuit – response - applications, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with base timing – Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit – Linearization through adjustment of driving waveform.

         TOTAL: 45 PERIODS

TEXT BOOK:
1. Sedra and Smith, "Micro Electronic Circuits"; Sixth Edition, Oxford University Press, 2011.

REFERENCES:
1. Robert L. Boylestad and Louis Nasheresky, "Electronic Devices and Circuit Theory", 10th Edition, Pearson Education / PHI, 2008
2. David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2008.
3. Millman J. and Taub H., "Pulse Digital and Switching Waveforms", TMH, 2000.
4. Millman and Halkias. C., Integrated Electronics, TMH, 2007.

EC6402   **COMMUNICATION THEORY**   **L T P C**
                                                              3 0 0 3

UNIT I   **AMPLITUDE MODULATION**   **9**
Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Pre-envelope & complex envelope - SSB and VSB –comparison -Super heterodyne Receiver.

UNIT II   **ANGLE MODULATION**   **9**
Phase and frequency modulation-Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator - Transmission bandwidth.

UNIT III   **RANDOM PROCESS**   **9**
Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT IV   **NOISE CHARACTERIZATION**   **9**
Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems. Narrow band noise – PSD of in-phase and quadrature noise –Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect.

UNIT V   **INFORMATION THEORY**   **9**
Entropy - Discrete Memory less channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon – Fanon codes

                                                    TOTAL: 45 PERIODS

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, "Fundamentals of Communication Systems", Pearson Education 2006.
2. S. Haykin, "Digital Communications", John Wiley, 2005.

REFERENCES:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, 2007.
2. B.Sklar, "Digital Communications Fundamentals and Applications", 2nd Edition Pearson Education 2007
3. H P Hsu, Schaum Outline Series - "Analog and Digital Communications" TMH 2006
4. Couch.L., "Modern Communication Systems", Pearson, 2001.

EC6403   **ELECTROMAGNETIC FIELDS**   **L T P C**
                                                              3 1 0 4

UNIT I   **STATIC ELECTRIC FIELD**   **9**
Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications,

Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT II   CONDUCTORS AND DIELECTRICS   9

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson"s equation, Laplace"s equation, Solution of Laplace equation, Application of Poisson"s and Laplace"s equations.

UNIT III   STATIC MAGNETIC FIELDS   9

Biot -Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere"s Circuital Law, Point form of Ampere"s Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

UNIT IV   MAGNETIC FORCES AND MATERIALS   9

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions involving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

UNIT V   TIME VARYING FIELDS AND MAXWELL'S EQUATIONS   9

Fundamental relations for Electrostatic and Magneto static fields, Faraday"s law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell"s equations, Integral form of Maxwell"s equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Poynting"s theorem, Time harmonic fields, Electromagnetic Spectrum.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOKS:

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics" , Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2008
2. Sadiku MH, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009

REFERENCES:

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005
3. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi, 2006
4. Ashutosh Pramanic, "Electromagnetism", Prentice Hall of India , New Delhi, 2006

EC6404   **LINEAR INTEGRATED CIRCUITS**   **L T P C**
                                                                              3 0 0 3

UNIT I   BASICS OF OPERATIONAL AMPLIFIERS   9
Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II   APPLICATIONS OF OPERATIONAL AMPLIFIERS   9
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III   ANALOG MULTIPLIER AND PLL   9
Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

UNIT IV   ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS   9
Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode $R \square 2R$ Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT V   WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS   9
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

                                                        TOTAL: 45 PERIODS

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.
2. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", 3rd Edition, Tata Mc Graw-Hill, 2007.

REFERENCES:

1. Ramakant A. Gayakwad, "OP-AMP and Linear ICs", 4th Edition, Prentice Hall / Pearson Education, 2001.
2. Robert F.Coughlin, Frederick F.Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth Edition, PHI, 2001.
3. B.S.Sonde, "System design using Integrated Circuits" , 2nd Edition, New Age Pub, 2001

4. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley International, 2005.
5. Michael Jacob, "Applications and Design with Analog Integrated Circuits", Prentice Hall of India, 1996.
6. William D.Stanley, "Operational Amplifiers with Linear Integrated Circuits", Pearson Education, 2004.
7. S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", TMH, 2008.

EC6405 **CONTROL SYSTEM ENGINEERING** **L T P C**
3 0 0 3

UNIT I CONTROL SYSTEM MODELING 9
Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT II TIME RESPONSE ANALYSIS 9
Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT III F REQUENCY RESPONSE ANALYSIS 9
Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol"s Chart - Use of Nichol"s Chart in Control System Analysis. Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB

UNIT IV STABILITY ANALYSIS 9
Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS 9
State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.
TOTAL: 45 PERIODS

TEXTBOOK:

1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5th Edition, 2007.

REFERENCES:

1. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.
2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum"s Outline Series, "Feed back and Control Systems" Tata Mc Graw-Hill, 2007.

4. John J.D"Azzo & Constantine H.Houpis, "Linear Control System Analysis and Design"", Tata Mc Graw-Hill, Inc., 1995.
5. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Addison – Wesley, 1999.

EC6411   CIRCUITS AND SIMULATION INTEGRATEDLABORATORY   L T P C
0 0 3 2

LIST OF EXPERIMENTS:

DESIGN AND ANALYSIS OF
1. Half and Full wave rectifiers
2. Fixed Bias Amplifier Circuit using BJT.
3. Voltage Divider Bias Circuit – CE configuration.
4. Differential Amplifier Using BJT.
5. Darlington Amplifier.
6. Source Follower with Bootstrapped Circuit.
7. Class A Power Amplifier.
8. Class B Complementary Symmetry Power Amplifier.

SIMULATION USING SPICE:
9. Frequency response of CE amplifier with Emitter resistance.
10. DC response of CS amplifier.
11. Frequency response of Cascode amplifier.
12. Transfer Characteristics of Class B Power Amplifier.
13. Design of a DC Power Supply using rectifier.

TOTAL: 45 PERIODS

EC6412   LINEAR INTEGRATED CIRCUITS LABORATORY   L T P C
0 0 3 2
LIST OF EXPERIMENTS:

DESIGN AND TESTING OF
1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.

SIMULATION USING SPICE
1. Simulation of Experiments 3, 4, 5, 6 and 7.
2. D/A and A/D converters (Successive approximation)

3. Analog multiplier
4. CMOS Inverter, NAND and NOR

TOTAL: 45 PERIODS

EE6461   **ELECTRICAL ENGINEERING AND CONTROL SYSTEM LABORATORY**
                                                              L T P C
                                                              0 0 3 2

LIST OF EXPERIMENTS:
1. Study of DC & AC motor starters
2. Study of three phase circuits
3. Speed Control of DC shunt motor
4. Load Test on DC shunt motor
5. OCC & Load Characteristics of DC shunt generator
6. Transfer Function of separately excited D.C.Generator.
7. Regulation of three phase alternator
8. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
9. Load test on single-phase transformer
10. Load test on single phase and three-phase Induction motor
11. Measurement of passive elements using Bridge Networks.
12. Study of transducers and characterization.
13. Digital simulation of linear systems.
14. Stability Analysis of Linear system using MATLAB or equivalent Software.
15. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software.
16. Design of Lead and Lag compensator.

TOTAL: 45 PERIODS

<u>**SEMESTER - 5**</u>

EC6501   **DIGITAL COMMUNICATION**   **L T P C**
                                                                                3 0 0 3

UNIT I   **SAMPLING & QUANTIZATION**   **9**
Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM - TDM

UNIT II   **WAVEFORM CODING**   **9**
Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding

UNIT III   **BASEBAND TRANSMISSION**   **9**
Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern – Equalization

UNIT IV   DIGITAL MODULATION SCHEME   9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - structure of Non-coherent Receivers - Principle of DPSK.

UNIT V   ERROR CONTROL CODING   9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Vitterbi Decoder

TOTAL: 45 PERIODS

TEXT BOOK:

1. S. Haykin, "Digital Communications", John Wiley, 2005

REFERENCES:

1. B. Sklar, "Digital Communication Fundamentals and Applications", 2nd Edition, Pearson Education, 2009
2. B.P.Lathi, "Modern Digital and Analog Communication Systems" 3rd Edition, Oxford University Press 2007.
3. H P Hsu, Schaum Outline Series - "Analog and Digital Communications", TMH 2006
4. J.G Proakis, "Digital Communication", 4th Edition, Tata Mc Graw Hill Company, 2001.

EC6502   PRINCIPLES OF DIGITAL SIGNAL PROCESSING   L T P C
**   3 1 0 4**

UNIT I   DISCRETE FOURIER TRANSFORM   9

Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

UNIT II   IIR FILTER DESIGN   9

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT III   FIR FILTER DESIGN   9

Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

UNIT IV   FINITE WORDLENGTH EFFECTS   9

Fixed point and floating point number representations – ADC –Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT V DSP APPLICATIONS 9
Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization.

TOTAL (L:45+T:15): 60 PERIODS

TEXT BOOK:

1. John G. Proakis & Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES:

1. Emmanuel C..lfeachor, & Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education / Prentice Hall, 2002.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Tata Mc Graw Hill, 2007.
3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, "Discrete-Time Signal Processing", 8th Indian Reprint, Pearson, 2004.
4. Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

EC6503 TRANSMISSION LINES AND WAVE GUIDES L T P C
3 1 0 4

UNIT I TRANSMISSION LINE THEORY 9
General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9
Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9
Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV PASSIVE FILTERS 9
Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K - Low Pass, High Pass, Band Pass, Band Elimination, m- derived sections - low pass, high pass composite filters.

UNIT V WAVE GUIDES AND CAVITY RESONATORS 9
General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel's differential equation

and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

TEXT BOOKS:

1. John D Ryder, "Networks, lines and fields", 2nd Edition, Prentice Hall India, 2010.

REFERENCES:

1. E.C.Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2006.
2. G.S.N Raju "Electromagnetic Field Theory and Transmission Lines" , Pearson Education, First edition 2005.

TOTAL (L:45+T:15): 60 PERIODS

GE6351   ENVIRONMENTAL SCIENCE AND ENGINEERING   L T P C
3 0 0 3

UNIT I   ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY   12
Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II   ENVIRONMENTAL POLLUTION   10
Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III   NATURAL RESOURCES   10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources:

Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT   7
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act –The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark). Enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness.

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT   6
Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd Edition, Pearson Education, 2004.
2. Benny Joseph, „Environmental Science and Engineering", Tata Mc Graw-Hill, New Delhi, 61 2006.

REFERENCES:

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standard", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice Hall of India PVT LTD, New Delhi, 2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2005

EC6504   MICROPROCESSOR AND MICROCONTROLLER   **L T P C**
                                                                       3 0 0 3

UNIT I   THE 8086 MICROPROCESSOR   **9**
Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II   8086 SYSTEM BUS STRUCTURE   **9**
8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III   I/O INTERFACING   **9**
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV   MICROCONTROLLER   **9**
Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V   INTERFACING MICROCONTROLLER   **9**
Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

                                                              TOTAL: 45 PERIODS

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.

REFERENCE:

1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012

EC6511　　　**DIGITAL SIGNAL PROCESSING LABORATORY**　　　**L T P C**
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LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE
1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolutions
3. Spectrum Analysis using DFT
4. FIR filter design
5. IIR filter design
6. Multirate Filters
7. Equalization

DSP PROCESSOR BASED IMPLEMENTATION
8. Study of architecture of Digital Signal Processor
9. MAC operation using various addressing modes
10. Linear Convolution
11. Circular Convolution
12. FFT Implementation
13. Waveform generation
14. IIR and FIR Implementation
15. Finite Word Length Effect

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EC6512　　　**COMMUNICATION SYSTEMS LABORATORY**　　　**L T P C**
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LIST OF EXPERIMENTS:
1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
8. Line coding schemes
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes - Linear Block Codes (Simulation)
11. Communication link simulation
12. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL: 45 PERIODS

EC6513 **MICROPROCESSOR AND MICROCONTROLLER LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM
1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments
7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2"s complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

SEMESTER - 6

MG6851 **PRINCIPLES OF MANAGEMENT** **L T P C**
3 0 0 3

UNIT I **INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS** **9**
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II **PLANNING** **9**
Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III **ORGANISING** **9**
Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR

Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV   DIRECTING   9
Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V   CONTROLLING   9
System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", 10th Edition, Prentice Hall (India) Pvt. Ltd., 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata Mc Graw Hill, 1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

CS6303   **COMPUTER ARCHITECTURE**   **L T P C**
                                                                        3 0 0 3

UNIT I   OVERVIEW & INSTRUCTIONS   9
Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II   ARITHMETIC OPERATIONS   7
ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Sub word parallelism.

UNIT III   PROCESSOR AND CONTROL UNIT   11
Basic MIPS implementation – Building data path – Control Implementation scheme – Pipelining – Pipelined data path and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV   PARALLELISM   9
Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V   MEMORY AND I/O SYSTEMS   9
Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 45 PERIODS

TEXT BOOK:

1. David A. Patterson and John L. Hennessey, "Computer Organization and Design", Fifth edition, Morgan Kauffman / Elsevier, 2014.

REFERENCES:

1. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", VI edition, Mc Graw-Hill Inc, 2012.
2. William Stallings "Computer Organization and Architecture", Seventh Edition , Pearson Education, 2006.
3. Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4. Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata Mc Graw Hill, New Delhi, 2005.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill, 1998.
6. http://nptel.ac.in/.

CS6551   COMPUTER NETWORKS   L T P C
                                                                  3 0 0 3

UNIT I   FUNDAMENTALS & LINK LAYER   9
Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT II   MEDIA ACCESS & INTERNETWORKING   9
Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)

UNIT III   ROUTING   9
 Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV   TRANSPORT LAYER   9
Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V   APPLICATION LAYER   9
Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Larry L. Peterson, Bruce S. Davie, "Computer Networks: A Systems Approach", Fifth Edition, Morgan Kaufmann Publishers, 2011.

REFERENCES:

1. James F. Kurose, Keith W. Ross, "Computer Networking - A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher, 2011.
4. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw – Hill, 2011.

EC6601   **VLSI DESIGN**   **L T P C**
                                                                      3 0 0 3

UNIT I   MOS TRANSISTOR PRINCIPLE   9
NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams.

UNIT II   COMBINATIONAL LOGIC CIRCUITS   9
 Examples of Combinational Logic Design, Elmore"s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III   SEQUENTIAL LOGIC CIRCUITS   9
Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV   DESIGNING ARITHMETIC BUILDING BLOCKS   9
Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V   IMPLEMENTATION STRATEGIES   9
Full custom and Semi-custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

                                                         TOTAL: 45 PERIODS

TEXTBOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, "Application Specific Integrated Circuits", Addisson Wesley, 1997

REFERENCES:

1. N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addision Wesley 1993
2. R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India 2005 3. A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

EC6602   **ANTENNA AND WAVE PROPAGATION**   **L T P C**
                                                                                                              3 0 0 3

UNIT I   FUNDAMENTALS OF RADIATION   9
Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT II   APERTURE AND SLOT ANTENNAS   9
Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis.

UNIT III   ANTENNA ARRAYS   9
N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV   SPECIAL ANTENNAS   9
Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas- Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V   PROPAGATION OF RADIO WAVES   9
Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

                                                                          TOTAL: 45 PERIODS
TEXT BOOK:

1. John D Kraus," Antennas for all Applications", 3rd Edition, Mc Graw Hill, 2005.

REFERENCES:

1. Edward C.Jordan and Keith G.Balmain" Electromagnetic Waves and Radiating Systems" Prentice Hall of India, 2006
2. R.E.Collin,"Antennas and Radiowave Propagation", Mc Graw Hill 1985.
3. Constantine.A.Balanis "Antenna Theory Analysis and Design", Wiley Student Edition, 2006.
4. Rajeswari Chatterjee, "Antenna Theory and Practice" Revised Second Edition New Age International Publishers, 2006.
5. S. Drabowitch, "Modern Antennas" Second Edition, Springer Publications, 2007.

6. Robert S.Elliott "Antenna Theory and Design" Wiley Student Edition, 2006.
7. H.Sizun "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

EC6611   **COMPUTER NETWORKS LABORATORY**   **L T P C**
                                                                0 0 3 2

LIST OF EXPERIMENTS:
1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Study of Socket Programming and Client – Server model
6. Write a socket Program for Echo/Ping/Talk commands.
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Encryption and decryption.

TOTAL: 45 PERIODS

EC6612   **VLSI DESIGN LABORATORY**   **L T P C**
                                                          0 0 3 2

LIST OF EXPERIMENTS

FPGA BASED EXPERIMENTS.

1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (I) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (I). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC DESIGN EXPERIMENTS: (BASED ON CADENCE / MENTOR GRAPHICS / EQUIVALENT)

4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (I)
6. Synthesis and Standard cell based design of an circuits simulated in 1(I) above. Identification of critical paths, power consumption.
7. For expt (c) above, P&R, power and clock routing, and post P&R simulation.
8. Analysis of results of static timing analysis.

TOTAL: 45 PERIODS

GE 6674   COMMUNICATION AND SOFT SKILLS - LABORATORY BASED   L T P C
0 0 4 2

UNIT I   LISTENING AND SPEAKING SKILLS   12
Conversational skills (formal and informal) – group discussion and interview skills – making presentations. Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on Youtube.

UNIT II   READING AND WRITING SKILLS   12
Reading different genres of tests ranging from newspapers to philosophical treatises – reading strategies such as graphic organizers, summarizing and interpretation. Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS   12
International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service (Language related) – Verbal ability.

UNIT IV   SOFT SKILLS (1)   12
Motivation – self image – goal setting – managing changes – time management – stress management – leadership traits – team work – career and life planning.

UNIT V   SOFT SKILLS (2)   12
Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical thinking – learning styles and strategies.

TOTAL: 60 PERIODS

REFERENCES:

1. Business English Certificate Materials, Cambridge University Press.
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
2. International English Language Testing System Practice Tests, Cambridge University Press.
3. Interactive Multimedia Programs on Managing Time and Stress.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.
5. Robert M Sherfield and et al. "Developing Soft Skills" 4th edition, New Delhi: Pearson Education, 2009.

WEB SOURCES:

http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

EC6701   **RF AND MICROWAVE ENGINEERING**   **L T P C**
                                                                         3 0 0 3

UNIT I   TWO PORT NETWORK THEORY   9
Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.

UNIT II   RF AMPLIFIERS AND MATCHING NETWORKS   9
Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, High power and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNIT III   PASSIVE AND ACTIVE MICROWAVE DEVICES   9
Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottky diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode, Introduction to MIC.

UNIT IV   MICROWAVE GENERATION   9
Review of conventional vacuum Triodes, Tetrodes and Pentodes, High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator, Traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backward wave Crossed field amplifier and oscillator.

UNIT V   MICROWAVE MEASUREMENTS   9
Measuring Instruments : Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Q-factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Theory and Applications", Pearson Education Inc., 2011
2. Robert E Colin, "Foundations for Microwave Engineering", John Wiley & Sons Inc, 2005

REFERENCES:

1. David M. Pozar, "Microwave Engineering", Wiley India (P) Ltd, New Delhi, 2008.
2. Thomas H Lee, "Planar Microwave Engineering: A Practical Guide to Theory, Measurements and Circuits", Cambridge University Press, 2004.
3. Mathew M Radmanesh, "RF and Microwave Electronics", Prentice Hall, 2000.
4. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc Graw Hill Publishing Company Ltd, New Delhi, 2005.

EC6702　　　　　**OPTICAL COMMUNICATION AND NETWORKS**　　　　**L T P C**
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UNIT I　　　INTRODUCTION TO OPTICAL FIBERS　　　　　　　9
Evolution of fiber optic system- Element of an Optical Fiber Transmission link-- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.

UNIT II　　　SIGNAL DEGRADATION OPTICAL FIBERS　　　　　9
Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling -Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III　　　FIBER OPTICAL SOURCES AND COUPLING　　　　9
Direct and indirect Band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition - Rate equations -External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fiber -to- Fiber joints, Fiber splicing-Signal to Noise ratio , Detector response time.

UNIT IV　　　FIBER OPTIC RECEIVER AND MEASUREMENTS　　　9
Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit.Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

UNIT V　　　OPTICAL NETWORKS AND SYSTEM TRANSMISSION　　9
Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget- Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra High Capacity Networks**.**

**　　　　　　　　　　　　　　　　　　　　　　　　　　TOTAL: 45 PERIODS**
TEXT BOOKS:

1. Gerd Keiser, "Optical Fiber Communication" Mc Graw -Hill International, 4th Edition., 2010.
2. John M. Senior , "Optical Fiber Communication", Second Edition, Pearson Education, 2007.

REFERENCES:

1. Ramaswami, Sivarajan and Sasaki "Optical Networks", Morgan Kaufmann, 2009.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 3rd Edition, 2008.
3. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

EC6703 **EMBEDDED AND REAL TIME SYSTEMS** **L T P C**
3 0 0 3

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9
Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN 9
The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS 9
Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

UNIT IV SYSTEM DESIGN TECHNIQUES AND NETWORKS 9
Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

UNIT V CASE STUDY 9
Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephone answering machine-Engine control unit – Video accelerator.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012.

REFERENCES:

1. Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012.
2. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007.
3. Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1999.
4. C.M. Krishna, Kang G. Shin, "Real-Time Systems", International Editions, Mc Graw Hill 1997
5. K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.
6. Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004.

EC6711   **EMBEDDED LABORATORY**   **L T P C**
                                                           0 0 3 2

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

                                                    TOTAL: 45 PERIODS

EC6712   **OPTICAL AND MICROWAVE LABORATORY**   **L T P C**
                                                           0 0 3 2

LIST OF EXPERIMENTS

OPTICAL EXPERIMENTS

1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

MICROWAVE EXPERIMENTS

1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

                                                    TOTAL: 45 PERIODS

EC6801   **WIRELESS COMMUNICATION**   **L T P C**
                                                                                  3 0 0 3

UNIT I   WIRELESS CHANNELS   9
Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT II   CELLULAR ARCHITECTURE   9
Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT III   DIGITAL SIGNALING FOR FADING CHANNELS   9
Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV   MULTIPATH MITIGATION TECHNIQUES   9
Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,

UNIT V   MULTIPLE ANTENNA TECHNIQUES   9
MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

                                                                       TOTAL: 45 PERIODS

TEXTBOOKS:

1. Rappaport,T.S., "Wireless communications", Second Edition, Pearson Education, 2010.
2. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.

REFERENCES:

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Upena Dalal, " Wireless Communication", Oxford University Press, 2009.
3. Van Nee, R. and Ramji Prasad, "OFDM for wireless multimedia communications", Artech House, 2000.

EC6802   **WIRELESS NETWORKS**   **L T P C**
                                     3 0 0 3

UNIT I   **WIRELESS LAN**   **9**
 Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II   **MOBILE NETWORK LAYER**   **9**
 Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing.

UNIT III   **MOBILE TRANSPORT LAYER**   **9**
TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks**.**

UNIT IV   **WIRELESS WIDE AREA NETWORK**   **9**
Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V   **4G NETWORKS**   **9**
Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.
                                    TOTAL: 45 PERIODS

TEXT BOOKS:

1. Jochen Schiller, ”Mobile Communications”, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.(Unit IV,V)

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband”, Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, “Wireless Networking”, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, “Modern Wireless Communications”, First Edition, Pearson Education 2013