PHYSICS
(HU-101)

Unit – I : Relativistic Mechanics
Inertial and Non-inertial Frames, Michelson-Morley Experiment, Postulates of Special Theory of Relativity, Galilean and Lorentz Transformation, Length Contraction and Time Dilation, Addition of Velocities, Mass Energy Equivalence and Variation of Mass with Velocity.

Unit – II : Interference
Coherent Sources, Conditions of Interference, Fresnel's Biprism Experiment, Displacement of Fringes, Interference in Thin Films – Wedge Shaped Film, Newton's Rings.

Diffraction : Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Telescope, Microscope and Grating.

Unit – III : Polarization
Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, Nicol Prism, Production and Analysis of Plane, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation, Polarimeter. **5**
Laser : Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser.

Unit – IV : Electromagnetics
Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, Poynting Theorem.

Magnetic Properties of Materials
Basic Concept of Para- , Dia and Ferro-Magnetism, Langevin's Theory of Diamagnetism, Phenomenon of Hysterisis and Its Applications

Unit – V : X-Rays
Diffraction of X-Rays, Bragg's Law, Practical Applications of X-Rays, Compton Effect.
Wave Mechanics : Wave Particle Duality, de Broglie Concept of Matter Waves, Heisenberg Uncertainty Principle, Schrödinger Wave Equation and Its Applications: Particle in a Box and One Dimensional Harmonic Oscillator.

References:
1. Robert Resmick : Introduction to Special Theory of Relativity
2. Aurthur Beiser : Perspectives of Modern Physics
3. A.K. Ghatak : Optics
4. Wehr Richords & Adiav : Physics of Atoms
5. O.Svelto : Lasers
6. D.J. Griffith : Electrodynamics

CHEMISTRY
(CY-201)

Unit – I

1. Molecular theory of diatomic heteromolecules, Bond theory of bonding in metals, Hydrogen bonding.

2. Solid state Chemistry:

Radius Ratio Rule, Space lattice (only cubes), Type of unit cell, Bragg's Law, Calculation of Density of unit cell. One & Two Dimensional solids, graphite as two dimensional solid and its conducting properties. Fullerene & its applications.

Unit-II

1. Basic principles of spectroscopic methods. The use of UV, Visible, IR, ^1H NMR, for the determination of structure of simple organic compounds.
2. Characteristics and classification of polymers.
3. Structures of the following polymers, viz, Natural and synthetic rubbers, Polyamide and Polyester fibres, polymethylmethacrylate, poly acrylonitrile and polystyrene. A brief account of conducting polymers (polypyrrole & polytiphene) & their applications.

Unit-III

1. Stability of reaction intermediates, e.g. Carbanion, Carbocation and free radicals. Types of organic reactions,& Mechanism of nucleophilic substitution reaction.
2. Mechanism of the following reactions.

(i) Aldol condensation. (ii) Cannizzaro reaction (iii) Beckmann rearrangement (iv) Hofmann rearrangement, and (v) Diels-Alder reaction

3. E-Z Nomenclature. Optical Isomerism of organic Compounds containing one chiral center. Examples of optically active compounds without chirality. Conformations of butane

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Unit-IV

1. Order & Molecularity of reactions. First & Second order reactions. Energy of activation.
2. Phase Rule: Its application to one component system (Water).
3. Equilibrium Potential, electrochemical cells (galvanic & concentration cells), Electrochemical theory of corrosion & protection of corrosion.

Unit-V

1. Hardness of water, softening of water by Lenny-S process & Reverse osmosis. Treatment of boiler feed water by Calgon process, Zeolites and ion-exchange resins.
2. Classification of fuels, Coal, Biomass & Biogas. Determination of gross and net calorific values using Bomb Calorimeter.
3. Environmental pollution : Types of pollution & pollutants, Air Pollution. Formation and depletion of ozone, smog and Acid rain.

References :

1. Organic Chemistry (Morrison & Boy)
2. Inorganic Chemistry (I.D. Lee)
3. Physical Chemistry (Barrow)
4. Environmental chemistry (Manahan)

PROFESSIONAL COMMUNICATION
(HU-101)

Unit – I : Technical Communication
Nature; Origin and Scope; Feature and General Writing; Significance; Style: Objective Style as Contrary to Literary Composition.
Forms of Technical Communication:
Reports: Types, Significance, Structure & Style of Report;
Writing of Reports: Project, Thesis, Dissertation Writing;
Technical Paper & Scientific Article Writing: Elements, Methods & Technical Objectives;
Technical Proposal: Nature, Divisions, Kinds, Uses.

Unit-II : Pre-Requisites of Technical Written Communication
Vocabulary Building : Homophones (Words Similar in sound but different in Meanings); Word-formation; One-Word substitute; New & Select Vocabulary Building (about 500 words)
Functional Grammar : Patterns and Correct usage (Parts of speech); Syntax Concord; Prepositions; Articles.
Requisites of Good Sentence and Paragraph Writing: Requisites of Good Sentence Writing; Paragraph Writing; Unity, Coherence and Emphasis; Development of Paragraph: Inductive Order, Deductive Order, Spatial, Linear, Chronological Orders etc. with Emphasis on Argumentative & Expository Writing.

Unit : III : Business Correspondence: Principles; Features; Sales and Credit Letters: Letters of Enquiry, Quotation, Order, Claim, Complaint and Adjustment letters, Bio-Data Making, Resumes/Job Application Processing.

Unit-IV : Language Learning Through Thematic and Value based Critical Reading (Non-Detailed Text Study) :
A Study of following Value-Oriented Essays:
A.L.Basham : The Heritage of India
S. Radhakrishnan : *The Gandhian Outlook*
Francis Bacon : *Of Studies*
J.B. Priestley : Making Writing Simple
Virginia Wooef : How should one Read a Book
R.K. Narayan : *A Bookish Topic*
C.E.M. Joad : The Civilization of Today

Study of following Short Stories for making the Students acquaint with the styles of great Writers of World:
O.H. Henry : The Gift of the Magi
R.N. Tagore : The Renunciation
Katherine Mansfield : *The Fly*
A.P. Chekhor : *The Lament*
M.R. Anand : The Barber's Trade Union
Ruskin Bond : The Eyes Are Not Here
D.H. Lawrence : The Rocking Horse Winner
Ernest Hemingway : The Capital of the World

Unit-V : Dimensions of Spoken English: Using English Language Laboratory :
Stress, Intonation, Rhythm, Phonemes, Allophones, Phonetic Transcription, Listening, Reading & Comprehension of Speech and Reproduction of Response.

Texts Books/ References
Singh R.P. (ed) : An Anthology of English Essay; OUP, New Delhi
Singh R.P. (ed) : An Anthology of English Short Stories; OUP, New Delhi.
Hornby A.S. : Guide to Patterns & Usage in English; OUP, New Delhi
Clark S. & Pointon : Word for Word; OUP, New Delhi
Ruther Ford A. : Basic Communication Skills; Person Education, New Delhi.
Singh R.P. : Functional Skills in Language & Literature; OUP, New Delhi
Bansal R.K. & Harrison : Phonetics in English; Orient Longman, New Delhi
Sethi & Dhamija : A Course in Phonetics & Spoken English; Prentice Hall, New Delhi.
Blum Rosen : Word Power; Cambridge University Press, New Delhi
Seely John : Writing Report; OUP, New Delhi
Suggested Readings :
Arora V.N. etal : Improve Your Writing; OUP Delhi
Mohan K. & Sharma R.C. : Business Correspondence of Report Writing; TMH, New Delhi.
Clive Upton etal : Oxford Dictionary of Pronunciation for Current English; OUP New Delhi.
A Dictionary of Modern English Usages; OUP, New Delhi
Michael Swan : Practical English Usages; OUP, New Delhi
John Alveyblrideh : American English Pronouncing Dictionary; OUP New Delhi.
Jons Daniel : English Pronouncing Dictionary; Cambridge University Press.

MATHEMATICS-I
(MA-101)

Unit - I : Matrices
Elementary row and column transformation, Rank of matrix, Linear dependence, Consistency of linear system of equations, Characteristic equation, Caley-Hamition Theorom, Eigen values and eigen vectors, Diagonalisation, Complex and unitary materices .

Unit - II : Differential Catculus-I
Leibnitz theorem, Partial differentiation, Eulers theorem, Curve tracing, Change of variables, Expansion of function of several variables

Unit - III : Differntial Caluculus-II
Jacobian, , Approximation of errors, Exterma of functions of several variables, Lagranges method of multipliers (Simple applications).

Unit - IV : Multiple Integrals
Double and triple integral, Change of order, Change of variables, Beta and Gamma functions, Application to area, volume, Dirichlet integral and applications.

Unit - V : Vector Calculus
Point functions, Gradient, divergence and curl of a vector and their physical interpretations, Line, Surface and Volume integrals, Greens, Stokes and Gauss divergence theorem.

ELECTRICAL ENGINEERING
(EE-101)

Unit-I

1. Steady State Analysis of A.C. Circuits :

Sinusoidal and phasor representation of voltage and current: single phase a.c. circuit-behaviour of resistance, inductance and capacitance and their combination in series & parallel and power factor, series parallel resonance-band width and quality factor : magnetic circuit.

Unit-II

2. D.C. Network Theory :

Circuit theory concepts-Mesh and node analysis.

Network Theorems- Super-position theorem. Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Star Delta transformation.

3. Measuring Instruments:

Construction and principle of operation of voltage and current measuring instruments; introduction to power and energy meters.

Unit-III

4. Three Phase A.C. Circuits :

Star-Delta connections, line and phase voltage/current relations, three phase power and its measurement.

5. Transformer :

Principle of operation, types of construction, phasor diagram, equivalent circuit, efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

Unit-IV

6. D.C. Machines

Principle of electromechanical energy conversion, types of d.c. machines, E.M.F. equation, Magnetization and load characteristics, losses and efficiency, speed control d.c. motors, applications.

7. Three phase Synchronous Machines :

Principle of operation and application of synchronous motor.

Unit-V

8. Three phase induction Motor

Principle of operation, types and methods of starting, slip-torque characteristics, applications.

9. Single phase Induction Motor :

Principle of operation, methods of starting.

References :

1. V. Del Toro. " Principles of electrical Engineering, "Prentice hall International.
2. W.H. Hayt & J.E. Kennedy," Engineering circuit Analysis, "Mc Graw Hill.
3. I.J. Nagrath, "Basic Electrical Engineering," Tata Mc. Graw Hill.
4. A.e. Fitgerald, D.E., Higginbotham and A Grabel, "Basic Electrical Engineering " Mc Graw Hill.
5. H. Cotton, "Advanced Electrical Technology" Wheeler Publishing.

MECHANICAL ENGINEERING
(ME-201)

A. THERMODYNAMICS

Unit – I : Fundamental Concepts and Definitions
Definition of thermodynamics, system, surrounding and universe, phase, concept of continuum, macroscopic & microscopic point of view. Density, specific volume, pressure, temperature. Thermodynamic equilibrium, property, state, path, process, cyclic process, Energy and its form, work and heat, Enthalpy.

Laws of thermodynamics
Zeroth law: Concepts of Temperature, zeroth law.
First law: First law of thermodynamics. Concept of processes, flow processes and control volume, Flow work, steady flow energy equation, Mechanical work in a steady flow of process.
Second law: Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law. Carnot cycle, Clausius inequality. Concept of Entropy.

Unit – II : Properties of steam and thermodynamics cycles:
Properties of steam, use of property diagram, Steam-Tables, processes involving steam in closed and open systems. Rankine cycle.
Introduction to I.C. Engines-two & four stoke S.I. and C.I. engines. Otto cycle, Diesel cycle.

B. MECHANICS AND STRENGTH OF MATERIALS

Unit-III : Force system and Analysis
Basic concept: Laws of motion. Transfer of force to parallel position. Resultant of planer force system. Free Body Diagrams, Equilibrium and its equation.
Friction: Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry fiction-Belt Friction.

Unit-IV : Structure Analysis
Beams: Introduction, Shear force and Bending Moment, shear force and Bending Moment Diagram for statically determinate beams.
Trusses: Introduction, Simple Trusses, Determination of Forces in simple trusses members, methods of joints and method of section.

Unit-V : Stress and Strain Analysis
Simple stress and strain: Introduction, Normal shear stresses, stress-strain diagrams for ductile and brittle materials, Elastic constants, one dimensional loading of members of varying cross sections, strain Energy.
Compound stress and strains: Introduction, state of plane stress, Principal stress and strain, Mohr's stress circle.
Pure Bending of Beams: Introduction, Simple Bending theory, Stress in Beams of different cross sections.
Torsion: Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

Reference:

1. Van Wylen G.J. & Sonnlog R.E. : Fundamentals of classical thermodynamics, John Wiley & Sons, Inc. NY.
2. Wark Wenneth : Thermodynamics (2nd edition), Mc Graw Hill book Co. NY.
3. Holman, J.P. : Thermodynamics, MC Graw Hill book Co. NY.
4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (Sl Edition) Central Publishing House Allahabad.
5. Yadav R. : Steam & Gas Turbines.
6. Kshitish Chandra Pal : Heat Power, Orient Longman Limited, 17, Chittranjan Avenue, Calcutta.
7. S. Rao, B.B. Parulekar, 'Energy Technology', Khanna Pub., New Delhi.
8. G. H. Ryder : "Strength of Materials".
9. F. L. Singer : "Strength of Materials".
10. Timoshenko : "Strength of Materials".

ELECTRONICS ENGINEERING
(EC-101)

Unit -I

Semiconductor materials and properties

Group-IV materials, Covalent bond, electron-hole concepts
Basic concepts of energy bands in materials, concept of forbidden gap
Intrinsic and extrinsic semiconductors, donors and acceptors impurities

Junction diode

p-n junction
depletion layer
v-i characteristics, diode resistance, capacitance diode ratings (average current, repetitive peak current, non-repetitive current, peak-inverse voltage).

Unit-II

Diode Applications

rectifiers (half wave and full wave)
calculation of transformer utilisation factor and diode ratings
filter (C-filter), calculation of ripple factor and load regulation
clipping circuits, clamping circuits, voltage multipliers

Breakdown diodes

breakdown mechanisms (zener and avalanche)
breakdown characteristics, zener resistance, zener diode ratings
zener diode application as shunt regulator

Unit-III

Bipolar Junction Transistor

Basic construction, transistor action
CB, CE and CC configurations, input/output characteristics
Biasing of transistors-fixed bias, emitter bias, potential divider bias, comparison of biasing circuits

Transistor Amplifier

Graphical analysis of CE amplifier, concept of voltage gain, current gain
h-parameter model (low frequency), computation of A_i, A_v, R_i, R_o of single transistor CE and CC amplifier configurations.

Unit-IV

Field Effect Transistor

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed-, self-biasing
MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics.
Computation of A_v, R_i, R_o, of single FET amplifiers using all the three configurations

Unit-V

Switching theory and logic design

Number systems, conversion of bases
Boolean algebra, logic gates, concept of universal gate, canonical forms.
Minimisation using K-map

Operational Amplifiers

Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators

Books and reference:

1. Boylestad and Nashelsky, 'Electronic Devices and circuits'
2. A Mottershead, 'Electronic devices and circuits'
3. Morris Mano, 'Digital Computer Design'

INFORMATION TECHNOLOGY
(IT-201)

Unit – I : Fundamental Concept of Information

Information Concept and Processing:

Definition of information, Data Vs Information, Introduction to Information representation in Digital Media, Text, image, graphics, Animation, Audio, Video etc., Need, Value and Quality of information, Concept of Information Entropy, Shannon's Principles, Entropy of Information, use of Entropy in Coding, Static & Dynamic codes, Category and Level of Information in Business Organization.

Information Representation:

Information Content, Entropy, Data Compression, Shannon Fano, Huffman Coding, Extended Huffman Codes, Arithmetic Coding, LZ78, LZW coding, Introduction to JPEG, MPEG, MHEG and other IT Industry Standards.

Unit-II : Concepts in Computer & Programming

Computer Appreciation:

Definition of Electronic Computer, History, Generations, Characteristic and Application of Computers, Classification of Computers, RAM/ROM, Computer Hardware, CPU, Various I/O devices, Peripherals, Storage Media, Software Definition, Role and Categories, Firmware and Humanwer.

Programming Language Classification & Program Methodology:

Computer Languages, Generation of Languages, Translators-Interpreters, Compiler/Interpreters, Compilers, Flow, Charts, Dataflow Diagram, Assemblers, Introduction to 4GLs, Software Development Methodology, Life Cycles, Software Coding, Testing, maintenance, ISO, CMM standards for IT industry.

UNIT : III : Digital Devices and Basic Network Concepts

Digital Fundamentals:

Various codes, decimal, binary, hexa decimal conversion, floating numbers gates, flip flops, adder, multiplexes, need for Data Transmission over distances, Types of Data Transmission, Media for Data Transmission, Modulation, AM, FM, Digital Modulation, Multiplexing of Signals

Data Communication & Networks:

Computer Networks, Networking of computers- Introduction of LAN and WAN. Network Topologies, Basic Concepts in Computer Networks, Client-server Architecture, ISDN, ATM, Token based protocol, CSMA/CD, Mobile Communication.

UNIT-IV : Internet and Web Technologies

Internet & World Wide Web:

Hypertext Markup Language, DHTML, WWW, Gopher, FTP, Telnet, Web Browsers, Net Surfing, Search Engines, Email, ISP, EDI, E-Commerce, Public Key Private Key, Safety of Business Transaction on web.

Web Technologies:

Elementary Concepts of E-Commerce, Basic Infrastructures for E-Commerce, Electronic Token, Security Threats, Electronic Payment Systems, Digital Signatures, Network, Security, Firewall, Introduction to Web Technologies.

UNIT-V : Concepts in Operating System, Office Tools and Data Management

Introductory concepts in operating system & Data Management:

Elementary Concepts in Operating System, textual Vs GUI Interface, Introduction to DOS, MS Windows, MS office Tools, MS WORD, MS EXCEL, MS Power Point, Tools for Data Management, Basics of Database management system, Introduction to basic Commands of Dbase, Foxpro, SQL Etc.

IT Industry Trends, Careers and Applications in India:

Scientific, Business, Educational and Entertainment Application, Industry Automation, Weather Forecasting, Awareness of Ongoing IT projects in India NICNET, BRNET etc. Application of IT to other Areas E Commerce, electronic governance, Multimedia, Entertainment.

References:

1. D S Yadav, "Foundations of IT", New Age, Delhi
2. Curtin, "Information Technology : Breaking News", TMH
3. Rajaraman, "Introduction to Computers", PHI
4. Nelson, "Data Compression", BPB.
5. Peter Nortans "Introduction to Computers", TMH.
6. Leon & leon "Fundamental of information Technology", Vikas
7. Kanter, "Managing Information System"
8. Lehngart, "Internet 101", Addison Wesley
9. CIS tems "Internet, An Introduction", Tata McGraw Hill.

ENVIRONMENTAL STUDIES
(CE-201)

Unit-I :
The Multidisciplinary nature of environmental studies
Definition, scope and importance, Need for public awareness
Natural Resources
Renewable and non-renewable resources
Natural resources and associated problems.
(a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
(f) Land resources: Land as 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.

Unit-2 : Ecosystems
• Concept of an ecosystem.
• Structure and function of an ecosystem.
• Producers, consumers and decomposers.
• Energy flow in the ecosystem.
• Ecological succession.
• Food chains, food webs and ecological pyramids.
• Introduction, types, characteristic features, structure and function of the following ecosystem:
(a) Forest ecosystem (b) Grassland Ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit-3 : Biodiversity and its conservation
Introduction- 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 Ex-situ conservation of biodiversity.

Unit-4 : Environmental Pollution
Definition
• Causes, effects and control measures of-
  (a) Air Pollution. (b) Water Pollution. (c) Soil Pollution (d) Marine Pollution. (e) Noise Pollution. (f)Thermal Pollution. (g) Nuclear hazards.
• Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
• Role of an individual in prevention of pollution.
• Pollution case studies.
• Diaster management: floods, earthquake, cyclone and landslides.

Unit-5: Social Issues and the Environment
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, Environmental ethics: Issues and possible solutions, Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.
Human Population and the Environment
Population growth, variation among nations, Population explosion- Family Welfare Programme, Environment and human health, Human Rights, Value Education., HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Suggested Field work

Visit to local area to document environmental assets-river/forest/grassland/hill/mountain, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of common plants, insects, birds, Study of simple ecosystems-pond, river, hill slopes etc

References

1. Agrawal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd. Ahmedabad- 380 013, India Email : mapin@icenet.net (R)
3. Brunner R.C., 1989, hazardous Waste Incineration, McGraw Hill Inc.
4. Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)
5. Cunningham, W.P, Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encycolopedia, Jaico Publ. House, Mubmbi,
6. De. A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R)
8. Gleick, H.P. 1993 Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press.
9. Hawkins R.E., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R)
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press
11. Jadhav, H. & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi
12. Mckinney, M.L. & School, R.M. 1996. Environmental Science Systems & Solutions, Web enhanced edition.
13. Mhaskar A.K., Matter Hazardous, Techno-Science Publication (TM)
14. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA,
16. Rai N,B, & Datta, A.K. 1987. Waste Water treatment. Oxford & IBH Publ. Co. Pvt. Ltd.
17. Sharma B.K., 2001. Environmental Chemistry. Goel Publ. House Meerut.
18. Survey of the Environment, The Hindu (M)
19. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
20. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol I and II, Environment Media (R)
21. Trivedi R.K. and P.k. Goel, Introduction to air pollution, Techno-Science Publication (TB)
22. Wagner K.D., 1998. Environment Management. W.B. Saunders Co. Philadelphia, USA

(M) Magazine (R) Reference (TB) Textbook.

MATHEMATICS II
(MA-201)

Unit - I : Differential Equations

Ordinary differential equations of first order, Exact differential equations, Linear differential equations of first order, Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - II : Series Solutions and Special Functions

Series solutions of ODE of 2nd order with variable coefficients with special emphasis to differential equations of Legendre, and Bessel . Legendre polynomials, Bessels functions and their properties.

Unit - III : Laplace Transform

Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Unit step function. Dirac delta function, Laplace transform of periodic functions, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - IV : Fourier Series and Partial Differential Equations

Periodic functions, Trignometric series, Fourier series of period 2π , Eulers formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series.

Introduction of partial differential equations, Linear partial differential equations with constant coefficients of 2_{nd} order and their classifications - parabolic, elliptic and hyperbolic with illustrative examples.

Unit - V : Applications of Partial Differential Equations

Method of separation of variables for solving partial differential equations,Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two-dimensions, Equations of transmission Lines.

PHYSICS PRACTICALS
(PH-151)

LIST OF EXPERIMENTS (ANY TEN)

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall effect and determine Hall coefficient, carnier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy bank gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the balistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

(Note : Additional experiments may be added based on contents of syllabus.)

CHEMISTRY PRACTICALS
(CY-251)

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of iron content in the given ore by using external indictor
6. pH-metric titration.
7. Determination of Equivalent weight of Iron by the chemical displacement method. The equivalent weight of copper is 63.5
   (Note : the procedure to be followed in carrying the above experiment is given as annexure)
8. Viscosity of an addition polymer like polyster by Viscometer.
9. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as colour developing agent and the measurements are carried out at λ_{max} 480 nm.
   Note : The general procedure of estimation is given on pp653-8 of the textbook of Quantitative Chemical Analysis by A.I. Vogel 6th Edition, Publisher : Pearson education Ltd. 2000)
10. Element detection & functional group identification in organic compounds

Annexure

In this experiment we will determine the equivalent weight of Iron, which displaces one equivalent of copper (63.5 g) from a solution containing copper ions.

Procedure: Clean a sample of iron (strip measuring 3.5cm×1.5cm) with a sand paper and weigh it accurately. Place it in a clean beaker (250ml) and pour into it 100ml of $CuSo_4$ solution of known strength (~ N/10) Allow the strip to stand in the beacker for about 30 minutes. Carefully withdraw the strip of iron (from the beaker) with a forceps and place it on a porcelain plate contained in a desiccafor (using $cacl_2$ as a desiccant). The quantity of copper sulphate remaining in solution – after the chemical displacement, is estimated by lodometric titration method. The dried strip of iron (containing the deposited copper) is then carefully weighed.

Observations:

Weight of iron strip = …….g

Wt. Of iron strip + copper = ……g

(after drying)

wt. of copper deposited on iron strip

Initial conc. of cu- final conc. of cu. (determined by titration)

The weight of iron, which goes into solution(as Fe So $_4$)

 (Initial weight of iron strip + weight of deposited copper) - weight of iron strip along with copper (after drying)

Eq.wt. of copper (63.5) = Wt. of Copper Deposited

Eq. Wt. of Iron Wt. of $Fe_{(s)}$ (going into solution)

The Eq. Wt. of Fe = ?

The % error involved in the experiment =…….

ELECTRICAL ENGINEERING LAB
(EE-151)

List of Practicals

A minimum of 10 experiments from the following :

1. Verification of Network Theorems.
2. Study of diode characteristcs.
3. To study a half wave and full wave rectifier circuit with and without capacitor filter and determine the ripple factor.
4. Determination of Common base and common emitter characteristics of a transistor.
5. Study of phenomenon of resonance in RLC series circuit.
6. Measurement of power in a three phase circuit by two wattmeter method.
7. Measurement of efficiency of a single phase transformer by load test.
8. Determination of parameters and losses in a single phase transformer by OC and SC test.
9. DC generator characteriestics.
10. Speed control of dc shunt motor.
11. Study running and reversing of a three phase induction motor.
12. Study of a single phase energy meter.
13. To study the various logic gate (TTL).

Additional experiments may be added based on contents of syllabi.

MECHANICAL ENGINEERING LAB
(ME-251)

List of Practicals

1. Study of boiler models - Babcock Wilcox, Lancashire and Locomotive.
2. Study of Steam engine and steam turbine models.
3. Study of 2-stroke and 4-stroke I.C.E. models.
4. Study of Fiat engine and/ or Diesel engine prototype.
5. Study of a vapour compression Refrigeration unit tutor/refrigerator.
6. Study of a window type air conditioner.
7. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
8. To conduct the compression test and determine the ultimate compressive strength for a specimen.
9. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.
11. To determine the hardness of the given specimen using Brinell / Rockwell / Vicker testing machine.

COMPUTER PROGRAMMING LAB
(CS-251)

List of Practicals

1. Practice of all internal and External DOS Commands
2. Write simple batch program
3. Giving exposure to Windows environment
4. File and program management in windows
5. Practice of all UNIX commands
6. Write simple shell script
7. Introduction to text editing and word processing
8. Exposure to advance feature supported by some editors
9. Net Surfing
10. Creation and usage of E-mail account
11. Write small program using C language
12. Handling of data structure in C
13. Familarizing mail account using PINE, deleting, creating folder/ mail-messages, adding signature, creating directory of addresses.

*(**Note :** List may be modified according to new software available)*

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WORKSHOP PRACTICE
(WS-151)

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

2. fitting Bench Working Shop :
1. Study of tools and operations
2. Simple exercises involving filling work.
3. Making perfect male-female joint
4. Simple exercise involving drilling/tapping/dieing.

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

4. Welding Shop :
1. Study of tools and operations .
2. Simple butt joint.
3. Lap joint.
4. oxy acetylene welding.

5. Sheet metal shop :
1.Study of tools and operations.
2. Making funnel complete with soldering.
3. Fabrication of tool box, tray, electrical panel box etc.

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

ENGINEERING GRAPHICS LAB
(CE-151)

1. Introduction
Graphics as a tool to communicate ideas, Lettering and' dimensioning, Construction of geometrical figures like pentagon and hexagon.

2. Orthographic Projection
Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections.
Projection of points. Pictorial view.
Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes.
Application to practical problems.
Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Solids lying on a face or generator on a plane.
Sectioning of solids lying in various positions, True shape of the section.
Development of lateral surfaces, sheet metal drawing.

3. Isometric Projection
Principles of isometric projection, Isometric projection using box and offset methods. 2

References:
1. Bhatt. N.D.: Elementary Engineering Drawing, Charothar Publishing.
2. Laxmi Narayan V & Vaish W. : A Text Book of Practical Geometry on Geometrical drawing.

COMMUNICATION LAB (ENGLISH)
(HU-251)

1. Orientation to Speech Sounds through International Phonetic Alphabets (I.P.S.) : British ReceivedPronunciation.
2. Speech Drills with Emphasis on Articulatory Phonetics, Place and Manner.

LIST OF PRACTICALS

Stress in Speech: Based on Accentual Patterns.
Intonation-Pattern-Practice: Rising, Falling and Level-Tones.
Rhythm in Speech-Practices On Strong and Weak-form Words.
Individual Conferencing / Speaking along with Quizzes.
Conversational Skills for Interview/ Seminars / Workshops with Emphasis on Kinesis along with Promotion of Phonetic-Script-Skills.
Group-Discussion: Practices based on Accurate & Current Grammatical Patterns.
Official / Public Speaking : Practices based on Mechanics of Articulation.
Theme Presentation-Practices Based on Linguistic Patterns.
Developing Argumentative Skills/ Role-Play Presentations with Proper Rhythmic Stress.
Testing comprehension : Reading and Listening Exercises with the use of Audio-Visual Aids.
Audience-based, Effective Speech Production (Elocution)

B.Tech. I Year (I & II Semester)
[Common to all Branches]

MA-301
MATHEMATICS-III

Unit - I : Integral Transforms

Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations.
Z – transform and its application to solve difference equations.

Unit - II : Functions of a Complex Variable - I

Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouvilles theorem, Fundamental theorem of algebra.

Unit - III : Functions of a Complex Variable - II

Representation of a function by power series, Taylor's and Laurent's series, Singularities, zeroes and poles, Residue theorem, evaluation of real integrals of type
$\int_0^{2\pi} f(\cos\theta, \sin\theta)\, d\theta$ and $\int_{-\infty}^{+\infty} f(x)\, dx$, Conformal mapping and bilinear transformations.

Unit - IV : Statistics and Probability

Moments, Moment generating functions, Skewness, Kurtosis,Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.

Unit - V : Curve Fitting and Solution of Equations

Method of least squares and curve fitting of straight line and parabola, Solution of cubic and bi-quadratic equations.

EE-301
NETWORK ANALYSIS AND SYNTHESIS

Unit – I :

Graph Theory : Graph of a Network, definitions, tree, co tree , link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

Unit – II :

Network Theorems (Applications to ac networks): Super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.

Unit – III :

Network Functions :

Concept of Complex frequency , Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from pole zero plot, frequency response and Bode plots.

Unit – IV :
Two Port Networks:
Characterization of LTI two port networks ZY, ABCD and h parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & Π Representation.

Unit – V :
(a) Network Synthesis :
Positive real function; definition and properties; properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.
(b) Filters :
Image parameters and characteristics impedance, passive and active filter fundamentals, low pass, highpass,band pass, band elimination filters.

Text Books:
1. M.E. Van Valkenburg," Network Analysis", Prentice Hall of India
2. D.Roy Choudhary,"Networks and Systems" Wiley Eastern Ltd.
3. Donald E. Scott : "An Introduction to Circuit analysis: A System Approach" McGraw Hill Book Company.
4. A.Chakrabarti,"Circuit Theory" Dhanpat Rai & Co.
Reference Books :
5. M.E. Van Valkenburg,"An Introduction to Modern Network Synthesis",Wiley Eastern Ltd.
6. W.H. Hayt & Jack E-Kemmerly, Engineering Circuit analysis" Tata McGraw Hill.
7. Soni, Gupta ,"Circuit Analysis", Dhanpat Rai & Sons.
8. Ram Kalyan, Linear Circuits Oxford University Press.

EC-301
SOLID-STATE DEVICES AND CIRCUITS

Unit-I : Special Diodes
LED, Varactor, Photodiode, Schotkey barrier, tunnel diodes and their constructions and characteristics.
Bipolar Junction Transistors : Transistor as an amplifier, small signal Equivalent circuits (Hybrid-pi, Ebers moll), Graphical Analysis, biasing the BJT for discrete-circuit design,
Unit-II :
Basic Single Stage BJT amplifier configurations transistor as a switch-cut off & saturation, complete static characteristics, Internal capacitances and second order effects Field Effect transistor-Structure and physical operation of Enhancement and depletion types MOSFET, I/V characteristics, MOSFET circuits at DC, MOSFET as an amplifier, biasing in MOS amplifier circuits, Basic configurations of single stage MOS amplifier, Internal capacitances of MOSFETS.

Unit-III : Frequency Response
S-Domain analysis, amplifier transfer function, Low and high frequency response of common source and common emitter amplifiers, common base & common gate cascade configurations, Frequency response of source followers, CC-CE cascade.
Unit-IV : Feed Back
General feed back structure, properties of negative feed back, four basic feed back topologies sedries shunt; series-series; shunt-shunt; & shunt-series feedback amplifier, determination of Loop gain, stability problem.
Unit-V : Oscillators
Basic principles of sinusoidal oscillator, RC oscillators: Weinbridge and phases half tuned oscillators: Collptts, Hartley and Clap. Crystal Oscillators.
Text book:
1. A.S. Sedra and K.C. Smith, "Microelectronic circuits", Oxford University Press (India).
2. B.P. Singh & R. Singh, Electronics Devices & Integrated Circuits, Pearson.
Reference Book
1. Millman, J. and Grabel, A./"Microelectronics"/McGraw Hill.
2. Bell, David A/ "Electronic Devices & Circuits"/Prentice Hall (India)4th Edition.
3. Nair, B. Somanathan /"Electronics Devices & Applications"/Prentice-Hall (India)
4. Neamen, Donald A./ "Electronic Circuit Analysis & Design"/Tata McGraw Hill.
5. Neamen, Donald A./"Semiconductor Physics & Devices"/Tata McGraw Hill.
6. Sedra, "Micro Electronics Circuits" Oxford University Press.

EC-302
SWITCHING THEORY

Unit-I : Introduction
Characteristics of digital system, Types of Digital circuits, Number system: Direct conversion between bases Negative numbers & BCD and their arithmetic's, Boolean Algebra, Minimization of Boolean Functions :Map & Tabular method upto 6 variable and miltiple output circuits Error detecting & correcting codes, Hamming & cyclic codes.

Unit-II : Combinational Logic Circuits
Design Procedure, Adders, subtractors & code conversion, Multiplexers/ Demultiplexers, encoder / decoders, decimal adders & amplitude comparators, ROM as decoder, PLA & PAL.

Unit-III : Sequential Logic Circuits
Flip –Flops and their conversions, Analysis and synthesis of synchronous sequential circuit, excitation table, state table & state diagram. Design of synchronous counters, shift registers and theie applications.
Algorithm State Machine: ASM chart, Timing considerations, Control Implementation Design with Multiplexers, PLA control
Asynchronous Sequential Circuits: Analysis Procedure Reduction of state & flow table, Race free state assignment.

Unit-IV : Logic Families
Diode, BJT & MOS as a switching element concept of transfer characteristics, Input characteristics and output characteristics of logic gates, Fan-in, Fan-out, Noise margin, circuit concept and comparison of various logic families: TTL, IIL, ECL, NMOS, CMOS Tri-state logic, open collector output, Interfacing between logic families, packing density, power consumption & gate delay.

Unit-V : Hazard and Fault Detection
Static and dynamic Hazard : Gate delay, Generation of spikes, Determination of hazard in combinational circuits, Fault detection methods: Fault Table & Path sensitizing methods.
Unit-VI : Memories
Sequential, Random Access, NMOS & CMOS Static and Dynamic Memory elements, one and multi-dimensional selection arrangement, Read-only memories, Formation of memory banks.

Text Books :
1. Digital Design by M Moris Mano, 2nd Edn.PHI
2. Introduction to Digital Microelectronic Circuits, by Gopalan, TMH
Reference Books :
1. Switching Circuit & Logic Design by Hill & Peterson, Wiley
2. Digital Circuit & Logic Design, by Holsworth.

EE-302
ELECTRONICS MEASUREMENTS AND INSTRUMENTATION

Unit-I : Theory of Measurement
Introduction, Performance Characteristics: static & dynamic standards, Error analysis: Sources, types and statistical analysis

Unit-II : Transducers
Passive transducers : Resistive, Inductive and capacitive
Active transducers : Thermoelectric, piezoelectric & photoelectric :
Bridges : Direct current and alternating current bridges, LCR bridges

Unit-III : Analog Meters
AC analog meters: Average, Peak and RMS responding voltmeters, sampling voltmeters. Electronics Analog meters: Electronics analog DC and AC voltmeter and ammeters, Electronic analog ohmmeter and multimeter

Unit-IV :Digital Meters
Analog to digital converter: Transfer characteristics, A/D Conversion techniques: Simple potentiometric & servo method, successive approximation, ramp type, Integrating & dual-slope intergrating method.
D/A Converter : Transfer characteristics, D/A conversion techniques Digital mode of operation, performance characteristics of D/A converters.
Display devices : Decimal, BCD and straight binary number, indicating system, numeric & alpha number display using LCD & LED, specification of digital meters: display digit

& counts resolution, sensitivity , accuracy, speed & settling time etc.

Unit-V : Oscilloscopes & RF Measurements
Types of oscilloscopes, controls, Measurements voltage, frequency time & Phase. High frequency measurements – RF impedancy
Probes: Types of probes, probe loading & measurement effect, probe specifications

Unit-VI: Signal Generators & Analyzers
Signal Generators: Sine-wave, non- sinusoidal & function generators, frequency synthesis techniques & digital signal generators.
Signal Analyzers : Distortion, wave and Network spectrum analyzers

Text Books :
1. Slectronic Instruments & Instrumentation Technology by MMS Anand, PHI Pvt. Ltd., New Delhi Ed. 2005
2. Electronics Instrumentation by H.S. Kalsi TMH Ed. 2004

Reference Books :
1. Electronics Instrumentation & Measurement Techniques by W.D. cooper & A.D. Helfrick, PHI 3rd Ed.
2. Electronic Measurement & Instrumentation by Oliver & Cage Mc-Graw Hill.

EE-351
NETWORK LAB

Note : Minimum eight experiments are to be performed from the following list.
1. Verification of principle of superposition with dc and ac sources
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellegin's theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with step voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests
Write Demo for the following (in Ms-Power point)
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade
11. Determination of frequency response of a Twin – T notch filter
12. College may add any three experiments in the above list.

EC-351
ELECTRONICS LAB 1ST

1. Study of CRO and multimeter applications.
2. Plot V-I characteristics of Junction diode under forward and reverse-biased condition. (Si & Ga)
3. Draw the waveshape of the electrical signal at the input and output points of the half-wave, full wave and bridge rectifiers.
4. Plot the V-I characteristics of zener diode.
5. Plot the I/P output characteristics for the common-base transistor.
6. To plot output characteristics of FET & measure pinch-off voltage. Calculate FET parameters at a given operating point.
7. Realize a voltage regulator using zener diode and study the load characteristics.
8. Design of P.S : 220/230 V (AC), 5VDC, 200 mA.

* College may add two more experiments in the above list

EC-352
DIGITAL ELECTRONICS LAB

1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
5. Transfer characteristics of CMOS inverters series and CD40 series and estimation of Gate delay of CD40 series CMOS inverter.
6. Monoshot multivibrators using 74121 and 74123.
7. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
8. Adder/ subtractor operation using IC7483 4 bit/ 8 bit.
9. Demultiplexer / Decoder operation using IC-74138.
10. Modulo N counter using programmable counter 74190.

EC-352

INSTRUMENTATION & MEASUREMENT LAB

1. Study of semiconductor diode voltmeter and its us as DC average responding AC voltmeter .
2. Study of L.C.R. bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer
(i) PT-100 trans
(ii) J- type trans.
(iii) K-type trans
(iv) Presser trans
6. Measurement of phase difference and frequency using CRO (lissajous figure)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements
9. RF Low and High Power Measurements
* College may add two more experiments in the above list.

CS-407

DATA STRUCTURES USING C

Unit – I

Introduction: Basic Terminology, Elementary Data Organization, Structure operations, Algorithm Complexity and Time-Space trade-off

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices and Vectors.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion, Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

UNIT – II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, D-queues and Priority Queues**.**

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow,

Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

UNIT – III

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Traversing Threaded Binary trees, Huffman algorithm**.**
Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

UNIT – IV
Sorting: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting**.**
Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

UNIT - V
Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.
File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

Reference text books:
1. Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd., New Delhi.
2. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education Asia, Delhi-2002
3. A. M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd., New Delhi.
Supplementary reference books:
1. K Loudon, “Mastering Algorithms With C”, Shroff Publisher & Distributors Pvt. Ltd.
2. Bruno R Preiss, “Data Structures and Algorithms with Object Oriented Design Pattern in C++”, Jhon Wiley & Sons, Inc.
3. Adam Drozdek, “Data Structures and Algorithms in C++”, Thomson Asia Pvt. Ltd.(Singapore)

ELECTROMAGNETIC FIELD THEORY

Unit-I
Review of Vector analysis, Rectangular, Cylindrical and Spherical coordinates and their transformation. Divergence, gradient and cvrv in different coordinate systems. Electric field intensity, Electric Flux density, Energy and potential.
Unit-II
Current and conductors, Diclectrics and capacitance, Poission's and Laplace's equation.
Unit-III
Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell's equation.
Unit-IV
Uniform plane waves, Plane wave reflection and dispersion.
Unit-5
Transmission lines, and guided waves
Text Book
Mayt, W.H. and Buck, J.A. 'Engineering Electromagnetics Tata McGraw Hill Publishing Co. Ltd., New Delhi Seventh edition.
Reference Books
1. Jordan E.C. and Balmain K.G. 'Electromagnetic' wave and radiating systems. PHI Second edition.
2. Krans, F 'Electromagnetics ' Tata McGraw Hill Fifth edition.
3. Ramo S, Whinnery T.R. and Vanduzer T, 'Field and Waves in Communication electronics' John Wiely and Sons Third edition.

EC-402
SIGNAL S AND SYSTEMS

Unit-I : Signals and Systems

Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equation.
Unit-II : Fourier Series and Fourier Transformer

The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equation.
Unit-III : Time and Frequency Characterization of Signals and Systems

Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.

Unit-IV : Sampling and Laplace Transform

Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals.
Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.

Unit-V : Z-Transform

Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.

Text Book

1. V. Oppenheim, A.S. Willsky and S. Hamid Nawab, 'signals & System', PEARSON Education, Second Edition, 2003.

Reference Book

1. Roberts, "Signals and Systems" TATA McGraw Hills.
2. P. Ramesh Babu, R. Ananda Natarajan, ."Signals and Systems", SCITECH Publications.
3. Charles L. Phillips, John M.PARR and EVEA. RISKIN, "Signals, Systems and Transforms", PEARSON Education, Third Edition.
4. Chen 'Signals & Systems, Oxford University, Press.

EC-403
SEMICONDUCTOR MATERIALS AND DEVICES

Unit-I : Crystal Properties and charge Carriers in Semiconductors

1. Elemental and compound semiconductor materials, crystal lattice structure.
2. Bonding forces and energy bands in solids, charge carriers in semiconductors, carrier concentrations, drift of carriers in electric and magnetic fields.

Unit-II : Excess Cariers in Semiconductors

3. Optical absorption, luminescence, carrier life time and photo conductivity, diffusion of carriers.

Unit-III : Junction Properties

5. Equilibrium conditions, biased junctions, steady state conditions, break down mechanism (rectifying diodes, Zener diodes).
6. Transient conditions, metal semiconductor junctions, hetero junctions, (Varactor Diode, switching diodes and Schottky diodes.)

Unit-IV : Transitors and Optoelectronic Devices

7. Bipolar junction transistors: Fundamentals of BJT operation, amplification with

BJTs, metal semiconductor field effect transistors (MESFET), metal insulator semiconductor field effect transistors (MISFET), Construction, Operation and characteristics of above devices.
8. Photodiodes, photo detectors, solar cell, light emitting diodes, light emitting materials, optical fibre, semiconductor lasers, material for semiconductor lasers.
Unit-V : Negative Conductance Microwave Devices and Power Devices

9. Tunnel diodes, degenerate semiconductors, transit time device: the IMPATT diode, the transferred electron mechanism : The GUNN diode.
10. Four layer devices : P-N-P-N diode, semiconductor controlled rectifier (SCR), bilateral devices : DIAC, TRIAC, IGBT.
Text Book
1. Ben G. Streetman, "Solid state electronic devices", Perason Eduction, 2003, Fifth edition .
Reference Books :
1. J. Millman and Halkiyas, "Integrated Electronics", TMH, 2002.
2. S.M. Sze, "Physics of Semiconductor devices", John Wiley.
3. Adir Bar-Lev, "Semiconductor and electronic devices", PHI.
4. D.A. Neaman, "Semiconductor physic and devices – basic principles", Home wood IL, 1992.

EE-405
ENERGY CONVERSION

UNIT-I
Basic Concepts in Rotating Machines : Elementary Machines, Synchronous Machines. d.c. Machine. Generated voltage of a.c. winding, distributed winding, hormonic content in distributed winding.
Rotating Magnetic field : Physical picture, Torque in round rotor machine.
Operations of Basic Machine Type : Synchronous machines, a.c. machines, d.c. machine, Matching characteristics of electric machines and load.
UNIT- 2
D.C. Motor: Introduction, e.m.f. and torque e.m.f equations, torque equation, power balance, liner magnetization circuit model, Generating mode, motoring mode, armature reaction, compensating winding, commutation, method of excitation, **Characteristics of D.C. motor :** Shunt, Series compound.
Starting of D.C. motor, speed control of d.c. motor, breaking of d.c. motors.
Unit-3
Synchronous Motor :
Introduction, Basic machine model, circuit model, determination of armature reaction, operating characteristics of motoring machine, operation at constant load with variable excitations.
Induction Motor :
Introduction, Constructions, flux and e.m.f. wave in induction motor, slip and frequency on rotor current, rotor e.m.f. and torque production, equivalent circuit, torque slip characteristics, break down torque, starting torque, starting of induction motor, speed control.

Unit-4

Motor Control by Static Power Converter

Motivation – Characterizes of power devices : Diode, SCR, TRIAC, GTO, Power transistor, Power MOS, IGBT, SIT, SITH, MCT.

Power converter : a.c./d.c. converter, a.c./ac. Converter, d.c./d.c. converter, d.c./a.c. Converter, control, D.c. motor control through converters, single phase converter, discontinuous armature current, full converter, torque speed characteristics, dual converter, control of d.c. series motor, these phase converter.

UNIT-5

Chopper control of d.c. motor:

Principle of operation, slip-up chopper, voltage and current wave forms, commutation A.C. motor control: Slip power recovery schemes, state kramer drive, phase control of induction motor.

Inverters:

Single phase half-bridge inverter, single-phase bridge inverter, three phase inverter, voltage and hormonic control of inverter, PWM inverter, sinusoidal pulse inverter.

Text Books:

I.J. Nagrath, D.P. Kothari: Electric Machines, TMH 2nd Ed.

Reference Books:

1. Fitzgarald, Kingsley, Kusko, Dumas : Electrical Machines, TMH.
2. M.H. Rashid : Power Electronic Circuits. Devices and applications, PHI.

CS 457
DATA STRUCTURES LAB

Write Program in C or C++ for following.

· Array implementation of Stack, Queue, Circular Queue, List.

· Implementation of Stack, Queue, Circular Queue, List using Dynamic memory Allocation.

· Implementation of Tree Structures, Binary Tree, Tree Traversal, Binary Search Tree, Insertion and Deletion in BST.

· Implementation of Searching and Sorting Algorithms.

· Graph Implementation, BFS, DFS, Min. cost spanning tree, shortest path algorithm.

EC-451
ELECTRONICS LAB-II

1. Study of single stage RC-coupled BJT amplifier (frequency response. Max. signal handling capacity, input impedance)
2. Study of single RC coupled FET amplifier (frequency response, max. signal handling capacity input impedance)
3. Study of Class AB/B push-pull amplifier.
4. Study of tuned amplifier and construction of oscillators.

5. Realization of fixed frequency Wein-bridge oscillator.
6. To realize emitter follower amplifier using Darlington pairs transistor and find the input impedance.
7. Application of operational amplifiers as summer, difference and integrator.
8. Op-Amp used as instrumentation amplifier.
* College may add two more experiments in the above list.

EC- 452
ELECTRONIC WORKSHOP & PCB LAB

(I) Winding Shop: Step down transformer winding of less than 5VA.
3
(II) Soldering shop: Fabrication of DC unregulated power supply
1
(III) PCB Lab: (a) Artwork & printing of a simple PCB.
2
(b) Etching & drilling of PCB.
2
(IV) Wiring & fitting shop: Fitting of power supply along with a meter in cabinet.
2
(V) Testing of power supply fabricated.
1
Note: No design work is involved.

EE- 455
ENERGY CONVERSION LAB

Minimum 8 experiments are to be performed from the following:
1. To obtain speed torque characteristics of a dc shunt motor.
2. To obtain speed torque characteristics of a dc series motor.
3. To run a dc shunt motor clockwise as well as anticlockwise.
4. To control the speed of a dc motor by field control.
5. To control the speed of a dc motor by armature voltage control
6. To obtain the running speed/torque characteristics of an induction motor.
7. To obtain the v-curves of a synchronous motor.
8. To obtain characteristic of SCR.
9. To study a UJT triggering of an SCR
10. To study commutation of an SCR by any commutation circuit.
11. Speed control of a single phases motor using TRIAC.
12. Organizing a chopper circuit using a power transistor.
13. Speed control of dc motor sing a phase controlled converter.
14. Speed control of dc motor using chopper.
15. Speed control of an induction motor using an inverter.

Analog Integrated Circuits (EC-502)

1 IC OP-AMP applications:
OP-AMP Fundamentals (brief review of
differential amplifier, current mirror, active load, level shifter, output stage; ac and dc characteristics) Basic building blocks using OP-AMPS. Inverting/Non-inverting VCVS, Integrators, Differentiators, CCVS and VCCS, Instrumentation Amplifiers.

2 Waveform Generator:
Square wave generators: 555Timer, Crystal controlled Oscillator
Ramp Generator: Triangle generator, Sawtooth generator
Sine wave generator: Requirement for sinusoidal oscillations, Wien-bridge and twin-T oscillators.
Function Generators: Multi op-amp function generators, IC function generators
Digitally controlled frequency synthesizer: PLL Fundamentals, PLL synthesizer, Totally digital synthesizer.

3 Active Filters:
Introduction to filtering: Frequency response, Characteristics and terminology, Active versus passive filters
Low pass filter: First order low pass active filter, second order active filter model, second order low pass filter characteristics, Sallen-Key unity gain filter, Sallen-Key equal component filter, Higher order filters.
High pass active filter.
Band pass filter: single op-amp band pass filter, multistage band pass filter
State variable filter

4 Non-linear Circuits:
Logarithmic Amplifiers, Log/Antilog Modules, Precision Rectifier, Peak Detector, Sample and Hold Circuits. OP-AMP as Comparator, Schmitt Trigger, Square and Triangular Wave Generator, Monostable Multivibrator.
IC Analog Multiplier applications
OTA

5 Voltage Regulators:
OP-AMP Regulators, IC Regulators, Fixed Voltage Regulators (78/79, XX), SMPS.

Microprocessors and Applications (TEC- 503)

1 Introduction to Microprocessors:
Evolution of Microprocessors, History of computers, Timing and control, memory devices: semiconductor memory organization, Category of memory, 8-bit Microprocessor (8085): Architecture, Instruction set, Addressing modes, Assembly Language Programming.

2 16-bit Microprocessors (8086/8088):
Architecture, Physical asegmentation, memory organization, Bus cycle, Addressing modes, difference between 8086 and 8088, Introduction to 80186 and 80286, Assembly Language Programming of 8086/8088.

3 Data Transfer Schemes:
Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART 8251), Keyboard-display controller (8279), Programmable Priority Controller (8259)

4 Programmable Interval Timer/ Counter (8253/8254):
Introduction, modes, Interfacing of 8253, applications. ADC and DAC: Introduction, DAC memthodes, ADC converters, Types of ADC, ADC IC (0808/0809, DAC and ADC Interfacing and Applications.

5 Advanced Microprocessors:
Introduction to 32-bit and 64-bit microprocessors, PowerPC, Microcontroller (8051): Introduction, Architecture, Instruction set.

Text Books

1. R. Singh and B. P. Singh : Microprocessor Interfacing and Application, New Age International Publishers, 2nd Edition.

2. B.P. Singh and R. Singh : Advanced Microprocessor and Microcontrollers, New Age International Publishers, 2nd Edition.

Reference Books

1. D. V. Hall : Microprocessors Interfacing, TMH (2nd Edition).
2. R. S. Gaunkar: Microprocessor Architecture, Programming and Applications with 8085/8080, Penram Publication
3. Y.C. Liu and G.A. Gibson : Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design, PHI 2nd Edition,ddress, 2//2 10

Automatic Control System (EC- 505)

1 Introduction :

open loop and closed loop control systems,feedback characteristics of control systems, Mathematical Representation of physical systems Electrical, Mechanical,Hydraulic, Thermal systems, Block diagram algebra and signal flow graphs, Mason's gain formula.

2Time domain analysis:

Standard Test Signals, Time response of First, Second and Higher order systems, Performance Indices. Error Analysis: Static and Dynamic Error Coefficients, Effect of adding poles and zeroes to the system, response of P, PI, and PID controllers.

3 Concept of Stability:

Concept of stability, Asymptotic and conditional stability, Routh Hurwitz Criterion, Root Locus technique (Concept and construction) Frequency Response Analysis: Correlation between time and frequency response, polar and Inverse polar plots, Nyquist stability criterion, Bode plots, All pass and minimum phase systems, M and N circle.

4 Design through compensation techniques:

Realization of lag, lead and lag-lead compensators, Design of closed loop control system using root locus and Bode plot Compensation

5 Stable Variable Analysis:

Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function.

6 Advances in Control Systems:

Basic Introduction to Neuralv Networks and Fuzzy logic control.

Text Books:

1. I J Nagrath & M Gopal, Control System Engineering; New Age International publishers.

Reference Books:

1. B C Kuo, Automatic Control Systems; PHI

2. Norman S Nise, Control System Engineering;John Wiley & Sons, Singapore

3. Dr D Ganesh Rao, Control System; Sanguine Technical Publisher, Bangalore

4. K Ogata, Modern Control Engineering; PHI.

Antenna and Wave Propagation (EC-504)

1. Antenna Principles:

Potential Functions & Electromagnetic Field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance.

Network Theorems:Directional Properties of Dipole Antenna. Antenna Gain, Effective Area, Antenna Terminal Impedance, Practical Antennas and Methods of Excitation, Antenna Temperature and Signal to Noise Ratio.

2. Antennas Arrays:

Two Element Array, Horizontal Patterns in Broadcast Arrays, Linear Arrays, Multiplication of patterns, effect of the earth on vertical patterns, Binomial array.

3. Wave Propagation:

Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Refelection and refraction waves by the Ionosphere Tropospheric Wave. Ionosphere Wave Propagation in the Ionosphere, Virtual Height, MUF Critical frequency, Skip Distance, Duct Propagation, Space wave

4. Practical antennas:

VLF and LF transmitting antennas, effect of antenna height, Field of short dipole, electric field of small loop antenna, Directivity of circular loop antenna with uniform current, Yagi-Uda array: Square corner yagi-uda hybride, circular polarization Rhombic Antenna: Weight and Leg length Parabolic Reflectors: Properties, Comparison with corner reflectors Horn Antenna: Length and Aperture. Introduction to Turstile Antenna Effect of ground on antenna performance. Broadband Antenna: Frequency independent concept, RUMSEY's Principle, Frequency independent planar log spiral antenna, Frequency independent planar log spiral antenna,frequency independent conical log antenna

5. Antenna Measurements:

Radiation Pattern measurement, Distance requirement for uniform phase, uniform field amplitude requirement, Introduction to phase measurement; Gain Measurement: Comparison method, Near field method, Introduction to current distribution measurement, Measurement of antenna efficiency, measurement of Noise figure and noise temperature of an antenna polarization measurement.

Text Books:

1. Jordan Edwards C. and Balmain Keith G./ "Electromagnetic Waves and Radiating Systems"/ Prentice Hall (India)

2. Kraus, John D. & Mashefka, Ronald J. / "Antennas: For All Applications" / Tata McGraw Hill, 3rd Ed.

Reference Books:

1. Prasad, K.D./ "Antennas and Wave Propagation"/ Khanna Publications

2. Collin, R. / "Antennas and Radiowave Propagation" / Tata McGraw-Hill

3. Hayt Jr. William H./ "Engineering Electromagnetics "/ Tata McGraw-Hill

Analog Integrated Circuits Lab (EC-552)

1. Measurement of Op-amp Parameters. (Open Loop Gain, Input offset Voltage, CMRR, Slew rate)
2. Determination of Frequency response of Op-Amp.
3. Precision Rectifier
4. Instrumentation Amplifier.
5. Open Loop operation of Op-amp -Comparators - Schmitt Trigger.
6. Astable & Monostable Operation Using 555.
7. IC Voltage Regulator.
8. Voltage Controlled Oscillator.
9. Phase Locked Loop.
10. Frequency Multiplier
11. A/D Converters & D/A Converters.
12. Second Order Active Filter- High Pass & Low Pass Realization

Microprocessor Lab (EC- 551)

8085/8086 Based Experiments
1. Signed Multiplication using Booth's Algorithm.
2. Recursive routine for finding Factorial N.
3. Look up table method for finding the ASCII of an alphanumeric code.
4. Interfacing with 8255 in I/O mode/BSR mode.
5. Interfacing with 8253.
6. Verification of Interrupts.
7. Interfacing with ADC/DAC.
8. Mini Project on some interfacing applications.
9. Serial communication between two kits through RS-232C using 8251.

Note :

Control System Lab (EC-551)

1. To use D.C. potentiometers as an error detectors.
2. To verify characteristics of (a) self excited magnetic amplifiers, (b) Self excited magnetic amplifier with (i) Positive feedback (ii) Negative feedback.
3. To draw characteristics of (a) Series connected (b) Parallel connected magnetic amplifier.
4. To draw characteristics of synchro torque transmitters. Also draw the characteristics error detector using of two synchros.
5. To study speed control of universal motor using SCR and stroboscope
6. Speed control of AC motor using TRAIC.

COMMUNICATION LAB 1-(EC-553)

1. To study Amplitude modulation using a transistor and determine depth of modulation.

2. To study envelope detector for demodulation of AM signal and observe diagonal peak clipping effect.

3. To study frequency modulation using reactance modulator.

4. Study of frequency modulation using varactor modulator.

5. Narrow band FM generator using Armstrong method.

6. Study of Foster- Seely discriminator.

7. Generation of DSB-SC signal using balanced modulator.

8. Generation of single side band signal.

9. Study of phase lock loop and detection of FM signal using PLL.

10. Measurement of noise figure using a noise generator.

11. Study of superheterodyne AM receiver and measurement of sensitivity, selectivity & fidelity.

12. Study and demonstration of active filter (low pass, high pass, and band pass type

Industrial Management (HU-605)

1 What is Operations Research?
OR-research model,
solving the OR model, Queuing and simulation models,
Art of modeling, Phases of OR study.

Introduction to Linear Programming:
Two variable L-P model, Graphical LP solution,
Analysis of selected LP models.

The Simplex Method:
LP solution space, Graphical to
algebraic solution, The simplex method, Artificial
starting solution, Special cases in simplex method
applications.

Transportation Model and its Variants:
Definition of transportation model, Non-traditional transportation
models, Transportation algorithms, Assignment model

Network Models:
Network definitions, Minimal
spanning tree algorithm, CPM and PERT.

Game Theory:
Optimal solution of two persons zero
sum games, Solution of mixed strategy games.
Introduction to Patents and Intellectual Propriety Right Notes

Introduction to Engineering Management:
Engineering and Management
Historical Development of Engineering Management

Functions of Technology Management
Planning and Forecasting
Decision Making
Organizing
Motivating and Leading Technical People
Controlling

Project Management
Project Planning and Acquisition
Project Organization, Leadership, and Control

Text Books:
1. Hamdy H Taha, Operations Research – An Introduction; 7e, Pearson Education/ PHI– 2002.
2. Babcock & Morse, Managing Engineering and Technology; Pearson Education, 2004

Digital Communication (EC-602)

1. **Elements of Digital Communication and Information Theory:**
Model of a Digital Communication, System, Probability Theory and Random Variables, Logarithmic Measure of Information, Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix Doing and Kraft Inequality, Shannon-Fanno and Huffman Coding.

2 **Digital Base band Transmission:**
PCM Coding, DM, DPCM, ADCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding and Their Power Spectra (No Derivation) Matched Filter Reciver, Derivation of Its Impulse Response and Peak Pulse Signal to Noise Ratio.
Correlation Detector Decision Threshold and Error Probability For Binary, Unipolar(ON-OFF) Signalling,
ISI, Nyquist Criterion For Zero ISI & Raised Cosine Spectrum.

3**Digital Modulation Techniques:**
Gram-Schmidt Orthogonalization Procedure, Types of Digital Modulation, Wave forms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK Differential Phase Shift Keying, Quadrature Modulation Techniques QPSK, Probability of Error and Comparison of Various Digital Modulation Techniques.

4Digital Multiplexing:
Fundamentals of Time Division Multiplexing, Electronic Commutator, Bit, Byte Interleaving T1 Carrier System, Synchronization and Signaling of T1, TDM, PCM Hierarchy, T1 to T4 PCM TDM System (DS1 to DS4 Signals)

5 **Error Control Coding:**
Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, Encoder and Decoder For Cyclic Codes, Convolution Codes, Tree diagram state diagram and Trellis Diagram, Viterbi and Sequential Decoding, Comparison of Performance.

Text Book:
1. Haykin, Simon / “Communication Systems” / John Wiley / 4th Ed.

References Books:
1. Singh, R.P. & Sapre, S.D. / “Communication Systems: Analog & Digital” / Tata McGraw-Hill.
2. B.P / “Modern Digital & Analog Communication Systems” / Oxford University Press /.
3. Simon Haykin / “Digital Communication” / John Wiley.
4. Taub & Schilling / “Principles of Communication Systems” / Tata McGraw-Hill /
5. A.B. Carlson / “Communication Systems” / Tata McGraw-Hill.
6. Prokis J.J / “Digital Communications” / McGraw Hill /
7. Charkrabarti, P. / “Analog Communication Systems” / Dhanpat Rai & Co.
8. Schaum’s Outlines / “Analog & Digital Communication” / Tata McGraw-Hill.

VLSI Technology and Design (TEC-603)

1.Era of Integrated Circuit: Introduction to Monolithic Integrated Circuit Technology, Bipolar & MOS IC, Film IC

2. **Crystal Growth:** Silicon wafer Preparation & characterization, **Oxidation:** Thermal oxidation, Oxide thickness measurement, Oxidation system.

2. **Diffusion** of dopants: Diffusion Eqns. Dopant profiles, sheet resistance, diffusion furnace, liquid and gaseous dopants, **Ion Implantation**: Ion implantation techniques, dopant profiles, apparatus used, **Exitaxy**: Eepitaxial growth of Si, apparatus for epitaxy, Photolithography techniques for pattern transfer, Mask making, photo resist & **Etching** techniques.
Film Deposition: Vacuum deposition & Sputtering apparatus, CVD Processes and its applications in IC Lab, **Metallization**

3. **1.MOS Transistor:** MOS Structure, MOS/IGFET Devices, MOS System under external bias, Structure & operation of MOSFET, Enhancement mode & Depletion mode devices, I-V Characteristics, MOSFET Scaling & Small-Geometry Effects.
2.CMOS Basic Circuits: MOS Inverters, static & dynamic characteristics, NAND, NOR, AOI Circuits, Design Considerations, Layout Design, Micron & Submicron technologies, parasitic effects, Physical limitations, Concepts of SPICE for Circuit simulation.

4. **Standard Digital ICs:** Combinational and Sequential MOS Logic Circuits, Design of standard Cells for LSI, VLSI Circuits, Computer-Aided Design Technology, Semiconductor Memories: DRAM, SRAM, Flash

5. **Programmable Logic Devices**: PLA, PAL, PLD/CPLD, PGA/FPGA, ASIC, VLSI Testing.

Text Books:

1. S.M. Sze (Ed.) / VLSI Technology / M Hill. 1988.
2. Basic VLSI Design by D.A. Pucknell & Eshraghian (PHI)
3. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)

References

1. S. Gandhi / VLSI Fabrication Principles / 2nd ED. John Willey 1994.
2. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)
3. S.A. Campbell / The Science and Engineering of Microelectronic Fabrication / Oxford Univ. Press 1996
4. Introduction to Digital Microelectronics Circuits by K. Gopalan (TMH)
5. Microelectronic Circuits *International Student Edition* by Sedra / Smith (Oxford)
6. Microelectronics by Milman & Grabel (Mc Graw-Hill)

Digital Signal Processing (EC-604)

1. **Discrete Fourier Transform:**
Frequency Domain Sampling: The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT.

2. **Efficient Computation of DFT**
Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, Efficient computation of the DFT of a 2NPoint real sequences, Gortezel Algorithm, Chirp Z-transform algorithm.

3. Basic IIR Filter Structures: Direct forms (I & II), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter structures-. Direct form structure, frequency sampling structure, Lattice structure, Linear phase FIR structure . FIR structures.

4. Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency Sampling Method, Design of FIR, Equiripple filter design Differentiators. Design of Hilbert Transformers.

5. **Design of IIR Filters From Analog Filters:** IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters.

Text Books:
1. Proakis, J.G. & Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall (India).

Reference Books:
1. Sanjit K. Mitra, "Digital Signal Processing", Third Edition, TMH, 2005
2. Oppenheim A.V. & Schafer, Ronald W., "Digital Signal Processing", Pearson Education.
3. Rabiner, L.R. and Gold B., "Theory and applications of DSP", PHI.
4. DeFatta, D.J., Lucas, J.G. & Hodgkiss, W.S., "Digital Signal Processing", John Wiley & Sons)

List of Elective

ELECTRONICS & COMMUNICATION ENGG.

ELECTIVE – I

1. TEC 011 Digital System Design Using VHDL
2. TEC 012 Fundamentals of Radar & Navigation
3. TEC 013 Artificial Neural Networks
4. TEC 014 Speech Processing

ELECTIVE – II

1. TEC 021 Principles of Secure Communication
2. TEC 022 Spread Spectrum Systems
3. TEC 023 Filter Design
4. TEC 024 Satellite Communication

ELECTIVE – III

1. TEC 031 Embedded Systems
2. TEC 032 Adaptive Signal Processing
3. TEC 033 Reliability and Quality Management
4. TEC 034 Biomedical Signal Processing

ELECTIVE – IV

1. TEC 041 Random Signal Theory
2. TEC 042 VLSI Design
3. TEC 043 Optical Networks
4. TEC 044 Digital Image Processing

EC-702 OPTICAL FIBER COMMUNICATION

1. Introduction: Block diagram of optical fiber communication system, Advantages of optical fiber communication

2. Optical fiber waveguides: structure of optical wave guide, light propagation in optical fiber using ray theory, acceptance angle, numerical aperture, skew rays, wave theory for optical propagation, modes in a planar and cylindrical guide, mode volume, single mode fibers, cutoff wavelength, mode field diameter, effective refractive index and group and mode delay factor for single mode fiber.

3. Transmission Characteristics of Optical fiber, Attenuation in optical fibers, intrinsic and extrinsic absorption, linear and non linear scattering losses, fiber bend losses. Dispersion and pulse broadening, intramodal and intermodal dispersion for step and graded index fibers, modal noise, over all fiber dispersion for multimode and monomode fiber, dispersion shifted fibers, modal birefringence and polarization maintaining fibers

4. Optical Sources: Basic concepts Einstein relations and population inversion optical feedback and threshold conditions, direct and indirect band gap semiconductors spontaneous and stimulated emission in p-n junction, threshold current density, Hetero junction & DH structure, semiconductor injection lasers structure &Characteristics of injection laser.

Drawback and advantages of LED, DH, LED, LED structures and characteristics

5.Optical detectors: Requirement for photo detections p-n photodiode, characteristics of photo detections, p-i-n and avalanche photodiodes, phototransistors & photoconductors

6. Direct detection receiver performance considerations: Noise sources in optical fiber communication, noise in p-n, p-i-n and APD receivers, Receiver structures.

7. Optical fiber communication systems: Principal components of an optical fiber communication system, source laminations, optical transmitter circuits, LED and laser drive circuits, optical receiver block diagram, simple circuits for pre-amplifier, automatic gain control and equalization, Regenerative repeater, BER of optical receiver, channel losses, ISI penalty and optical power budgeting for digital optical fiber system, line coding, analog systems, Direct intercity and sub carrier intensity modulation using AM, FM and PM. Block diagram and detection principle of coherent optical fiber system.

Text / Reference Books:

Text Book:

1. Optical fiber Communication: John M.S Senior PHI, 2nd Ed.

Reference Books:

1. Optical Communication: J. Gowar PHI, 2nd Ed.
2. Optical fiber Communication: G.E. Keiser Mc Graw-Hill, 3rd Ed.
3. Optoelectronics: Wilson & Hawkes PHI, 2nd Ed.

EC-701 ELECTRONIC SWITCHING

1. Introduction: Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.

2. Digital switching: Switching functions, space division switching, multiple stage switching, nonblocking switches, blocking probabilities, Lee graphs and Jacobaeus, foulded four wire switches, path dinding, switch matrix control; Time division switching, analog and digital time division switching, a digital memory switch, time stage in general, two dimensional switching, implementation complexity of TD switches, multiple stage time and space switching, STS switching , TST switching, TSSST switches, No.4 ESS Toll switch, System 75 digital PBX, Digital cross connect systems, Consolidation and segregation, DCS hierarchy, integrated cross connect equipment, digital switching in analog environment, zero loss switching.

3. Telecom Traffic Engineering: Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, Markov processes, birth-death processes, incoming traffic and service time characteristics, Poisson arrival process, holding time of calls, blocking models and loss estimates, lost calls cleared systems with infinite and finite subscribers, lost calls returned systems and lost calls held system, Delay systems and Erlang C formula.

4. Control of Switching Systems: Call processing functions, sequence of operations, signal exchanges, state transition diagrams; common control, Reliability availability and security; Stored program control, processor architecture, centralized SPC, distributed SPC, Level3, Level2 and Level-1 processing, SPC software, system software and Language processor, SDL, application software.

5. Signalling : Customer line signalling, AF junctions and trunk circuits, outband and inband signalling, PCM and inter register signalling, Common channel signaling, general principles and network, CCITT signaling system No. 6 and 7, HDLC protocol, Signal units, the signaling information field.

6. Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching , ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.

Text / Reference Books:

1. Telecommunication switching System and networks, Thiagarajan Viswanathan, PHI.
2. Telecommunication switching, Traffic and Networks, J.E. Flood, Pearson education.
3. Digital Telephony, J.C. Bellamy, John Wiley, 3rd ed.
4. Principles of Communication Systems, Taub and Schilling, TMH

EC 753 Communication Lab III

Experiments on Optical Fiber Communication

1. Setting up fiber optics analog Link and verification through voice signal transmission.
2. Study of losses in optical fiber.
3. Setting up fiber optic digital link.
4. Transmission of TDM signal using fiber optic digital link
4
5. To establish PC to PC communication link using optical glass fiber & RS 232 interface

Experiments based on MATLAB

1. Use of Monte Carlo Simulation estimate and plot error probability for a binary communication system employing matched filter.
2. Implement an adaptive equalizer based on LMS algorithm and study the effect of

step size on MSE.
3. Perform Monte-Carlo simulation of a 4PSK Communication system and determine and plot symbol and bit error rates.
4. Perform Monte- Carlo simulation of four phase DPSK system and plot symbol error rate.
5. Determine the error probability for orthogonal signalling using MATLAB employing (a) Hard Decision (b) Softdecision decoding.
6. Find the output of a convolution encoder for a given input sequence using MATLAB.
College may add four more experiments in the above list.

EC 801 Wireless Communication

I Evolution of mobile radio communication fundamentals. Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model.
Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels, types of fading, theory of multi-path shape factor for fading wireless channels.

II Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FHSS), performance of DS-SS, performance of FH-SS, modulation performance in fading and multipath channels, fundamentals of equalisation, equaliser in communication receiver, survey of equalisation techniques, linear equaliser, linear equaliser, non-linear equalisation, diversity techniques, RAKE receiver.

III Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, time division multiple access, space division multiple access, and frequency division multiple access.
Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.
Introduction to wireless networks, 2G, 3G wireless systems, wireless standards.

Text Book:

1. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson

Reference Books:

1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin S & Moher M., “Modern wireless communication”, Pearson, 2005.
5
4. R. Pandya, “ Mobile and personal communication system”, PHI.

EC - 802 Data Communication Networks

Unit Topic Lectures
I INTRODUCTION: Network structure, network architectures. The OSI reference model, services, standardization, Other architectures, Connection oriented and connection less services, example networks.

2. The Physical Layer: Transmission media, EIA RS-232C, EIA RS-449.
Pulse code modulation. FDM & TDM.
Circuit switching. Packet switching. Hybrid switching.
Polling. CCITT X.21. Ethernet.
3. The Data Link Layer: Basic link protocols. Character oriented and bit oriented protocols. The ALOHA protocols.
IEEE standard 802 for LAN, framing, Error control, Flow control.
4. The Network Layer: Design Issues. Routing Algorithms. Congestion control Algorithms. Subnet concept, Virtual circuit and Data gram Subnet, Flow control, Internetworking, Bridges, Routers, Gateways and different level switches.
5.The Transport Layer: Design Issues. Connection management. Study of Internet and ATM transport layer protocols.
6.Internet Issues: Principles of bridges and routers. The TCP/IP Protocol suite: Overview of TCP/IP. Addressing, Subnetting and network layer protocols.
7.Application layer services: DNS, DHCP, FTP, TFTP, SMTP, SNMP, HTTP, WWW.

References:
1. Andrew S. Tanenbaum: Computer Networks, PHI India.
2. Leon-Garcia,Widjaja: Communication Networks, TMH.
3. Forouzan: Data Communications & Networking, TMH.
4. William Stallings: Data & Computer Communication, Prentice Hall.

EC - 011 Digital System Design Using VHDL
Unit
1. INTRODUCTION TO VHDL: VHDL description, combinational networks, modeling flip flop using VHDL, VHDL model for multiplexer, comliance and simulation of VHDL, codes, modeling a sequential machine, variables, signals and constants, arrays VHDL operators, VHDL functions, VHDL procedures, packages and libraries, VHDL model for a counter.
ADVANCED VHDL: Attributes, transport and inertial delays, operator over loading, multi valued logic and signal resolution, IEEE-1164, standard logic, generic, generates statements, synthesis of VHDL codes, synthesis examples, file handling and TEXTIO.
2. DESIGN OF NETWORKS FOR ARITHMATIC OPERATIONS: Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary numbers, design of binary divider.
DIGITAL DESIGN WITH SM CHART: state machine charts, derivation of SM charts, realisation of SM charts, implementation of dice game, alternative realisation of SM charts using microprogramming, linked state machine.

3.FLOATING POINT ARITHMETIC: Representation of floating point numbers, floating point multiplication, other floating point operations.
DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xinx 3000 series FPGAs, Xinx 4000 series FPGAs, using one hot state assignment.

4. MEMORY MODELS FOR MEMORIES AND BUSES: Static RAM,a simplified 486 bus model, interfacing memory to microprocessor bus.

5. DESIGN EXAMPLES: UART design, description of MC68HC05 microcontroller, design of microcontroller CPU, complete microcontroller design.

Text Book:

1. Charles H Roth Jr, "Digital System Design using VHDL", Thomson Learning, 2002.

Reference Books:

2. Stephen Brown & Zvonko Vranesic, "Fundamentals of digital logic design with VHDL", TMH, 2nd Ed., 2007.

3. Jhon F Wakerly, "Digital design", PHI, 4th Ed.

TEC – 012 Fundamentals of Radar and Navigation

1.RADAR SIGNAL MODELS: Amplitude models, distributed target forms of range equation, radar cross section, statistical description of radar cross section, Swerling model, Clutter, signal to clutter ratio, temporal and spatial correlation of clutter, noise model and signal to noise ratio, frequency models, Doppler shift, simplifies approach to Doppler shift, stop and hop assumption, spatial model, variation with angle, variation with range, projections, multipath, spectral models.

2.RADAR WAVE FORMS: Waveform matched filter of moving targets, ambiguity function, ambiguity function of the simple matched pulse filter for the pulse burst, pulse by pulse processing, range ambiguity, Doppler response and ambiguity function of the pulse burst.

3. DETECTION FUNDAMENTALS: Radar detection as hypothesis testing, Neyman-Pearson detection rule, likelihood ratio test, threshold detection of radar signals, non-coherent integration of nonfluctuating targets, Albersheim and Shnidaman equations, Binary integration.

4. RADIO DIRECTION FINDING: loop direction finder, goniometer, errors in direction finding, adcock and automatic direction finders, commutated aerial direction finder.

RADIO RANGES: LF/MF four course radio range, VOR, ground equipment & receiver, VOR errors.

HYBERBOLIC SYSTEM OF NAVIGATION: LORAN Decca & Omega system.

5. AIDS TO APPROACH AND LANDING: ILS, GCA & MLS

DOPPLER NAVIGATION: Beam configuration, doppler frequency equation, track stabilisation and doppler spectrum, components of doppler navigation system, doppler radar equipment, CW & FMCW Doppler radar, frequency trackers, doppler range equation.

SATALLITE NAVIGATION SYSTEM: transit system, NAVSTAR, GPS, basic principles of operation, signal structure of NAVSTAR broadcasts, data message, velocity determination, accuracy of GPS & differential navigation, NAVSTAR receiver.

Text and reference books:

1. Fundamentals of radar signal processing, Mark A Richards, TMH.
2. Elements of Electronics Navigation, N. S. Nagraja, TMH.
3. Radar principles, Peebles Jr. P. Z., Wiley, NY.

EC – 013 ARTIFICIAL NEURAL NETWORKS

1 **Introduction**

Introduction and history, human brain, biological neuron, models of neuron, signal flow graph of neuron, feedback, network architecture, knowledge representation, Artificial intelligence and neural networks.

2 Learning Process

Error correction learning, memory based learning, Hebbian learning, competitive learning, Boltzmann learning, learning with and without teacher, learning tasks, memory, adaptation.

Artificial neurons, Neural networks and architectures

Introduction, neuron signal function, mathematical preliminaries, Feedforward & feedback architecture.

Geometry of Binary threshold neurons and their networks

Pattern recognition, convex sets and convex hulls, space of Boolean functions, binary neurons for pattern classification, non linear separable problems, capacity of TLN, XOR solution.

3. Perceptrons and LMS

Learning objective of TLN, pattern space & weight space, perceptron learning algorithm, perceptron convergence theorem, pocket algorithm, α – LMS learning, MSE error surface, steepest descent search, μ – LMS and application.

Backpropogation and other learning algorithms

Multilayered architecture, backpropagation learning algorithm, practical considerations, structure growing algorithms, applications of FFNN, reinforcement learning.

4 **Statistical Pattern Recognition**

Bayes' theorem, classical decisions with bayes' theorem, probabilistic interpretation of neuron function, interpreting neuron signals as probabilities, multilayered networks & posterior probabilities, error functions for classification problems.

RBF Networks

Regularization networks, generalized RBF networks, RBF network for solving XOR problem, comparison of RBF networks & multilayer perceptrons.

Stochastic Machines

Statistical mechanics, simulated annealing, Boltzmann machine.

5 **Adaptive Resonance Theory**

Building blocks of adaptive resonance, ART 1.

Self Organizing Feature MAP

Introduction, Maximal eigenvector filtering, principal component analysis, generalized learning laws, competitive learning, vector quantization, maxican hat networks, SOFM, applications ofSOFM.

Fuzzy sets, Fuzzy systems and applications, neural networks and fuzzy logic,

Text Books

1. Simon Haykin, "Neural Networks,", Pearson Education 2nd edition.
2. Satish Kumar, "Neural Networks," Tata McGraw-Hill.

Reference Books

1. Jack M. Zurada, " Introduction to Artificial Neural System," Jaico Publishing House.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications," McGraw-Hill Inc.

EC-014 SPEECH PROCESSING

Unit Topic Text Book Lectures

1. Digital models for speech signals: Mechanism of speech production & acoustic phoenetics, the acoustic theory of speech production, lossless tube models, and digital models for speech signals.
2. Time Domain methods of speech sampling: Time dependent processing of speech, short time energy and average magnitude, short time average zero crossing rate, discrimination between speech& silence, pitch period estimation using parallel processing, short time autocorrelation function & AMDF, pitch period estimation using autocorrelation function.
3. Short time Fourier Analysis: Definition and properties, design of filter banks, implementation of filter bank summation method using FFT, spectrographic displays, pitch detection, analysis by synthesis phase, vocoder and channel vocoder .
4. Homomorphic speech processing: Homomorphic system for convolution, complex cepstrum of speech, pitch detection using Homomorphic processing, formant estimation, Homomorphic vocoder.
5. Linear Predictive Coding of Speech: Basic principles of linear predictive analysis, the autocorrelation method, computation of the gain for the model, solution of LPC equations for auto correlation method, prediction error and normalized mean square error, frequency domain interpretation of mean squared prediction error relation of linear predictive analysis to lossless tube models, relation between various speech parameters, synthesis of speech from linear predictive parameters, application of LPC parameters.

Text / Reference Books:

1. Digital Processing of speech signals by R.L. Rabiner & R.W. Schafer, Pearson Education.
2. Voice processing by G.E. Pelton, McGraw –Hill.
3. Speech Analysis, synthesis and perception by J.L. Flanagan, Springer-Verlog. N. Y.
4. Diserete time speech signal Processing: Principles and Practices by Jhomas Quatieri, Pearson Education.

TEC-021 PRINCIPLES OF SECURE COMMUNICATION

1. Direct Sequence Spread Spectrum Systems: Model of SS digital communication system, direct sequence spread spectrum signal, error rate performance of the decoder, processing gain and jamming margin, uncoded DSSS signals, applications of DSSS signals in anti-jamming, low detectability signal transmission, code division multiple access and multipath channels, effect of pulsed interference on DSSS systems, Generation of PN sequences using m sequence and Gold sequences, excision of narrowband interference in DSSS systems, acquisition and tracking of DSSS system.

2. Frequency Hopped Spread Spectrum Systems: Basic concepts, slow and fast frequency hopping, performance of FHSS in AW GN and partial band interference, FHSS in CDMA system, Time hopping and hybrid SS system, acquisition and tracking of FH SS systems.

3. Cryptographic Techniques : Classical encryption technique, Symmetric cipher model, cryptography and cryptanalysts, Substitution techniques, transposition techniques

4. Block Cipher and Data Encryption Standard : Block cipher principle, data encryption standard (DES) strength of DES, differential and linear cryptanalysts, block cipher design principles, simplified advanced encryption standard (S-AES), multiple encryption and triple DES, Block cipher modes of operation, stream ciphers and RC_4 algorithm.

5. 5. Public Key Cryptography: Prime numbers, Fermat and Euler's theorem, Chinese remainder theorem, discrete algorithms, principles of public key cryptosystems, RSA algorithm, key management Diffie-Hellman key exchange, message authentication requirements and functions.

Text / Reference Books:

1. Digital Communication by J.G. Proakis McGraw Hill 2nd Ed.
2. Cryptography and Network Security by W. Stallivgs 4th Ed., PHI
3. Digital Communication by Simon Haykin, Wiley.
4. Principle of Communication systems by Taub & Schilling TMH.
5. Cryptography and secure Communications by M.Y. Rhee, Mc Graw Hill

TEC- 022 Spread Spectrum Systems

I Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping systems, pulse FM(chirp) system, hybrid systems.

II Coding for communication and ranging- Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composite codes, code selection and signal spectra, error detection and correlation codes.

III Modulation and demodulation – Balance modulator, quadriphase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, costas loop, FM feedback, PDM and FH demodulators

IV Need for synchronization, types of synchronizers, RF link- Noise figure, cochannel users, dynamic range and

AGC, propagation medium, overall transmitter and
receiver design.
V Test and evaluation of spread spectrum systemselectivity,
sensitivity, jamming margin, synch
acquisition, processing gain. Transmitter measurements.
Text Book:
R. C. Dixen, "Spread spectrum systems with commercial application", Jhon
Wiley, 3rd Ed.
Reference Book: H. Taube and D. L. Schilling, "Priciples of Communication systems",
Tata Mc Graw Hill, 2nd Ed. Reprint 2007.

TEC 023 Filter Design

Unit Topic Book

1 Review of op-amps circuits, Categorization of filters-Low-pass filter,
High-pass filter, band-pass filter, band-reject filter, Gain equalizers, and
Delay equalizers.
1

2 Approximation Theory: Butterworth approximation, Chebyshev
approximation, Inverse Chebyshev approximation, Basic of sensitivity,
Frequency Transformations.
1

3 Three amplifier Biquad: Basic low pass and band pass circuit,
realization of the general Biquadratic Functions, summing of four
Amplifier biquad, feed forward three amplifier biquad, Passive Ladder
structures, Inductor Substitution using Gyrator, Transformation of
elements using the FDNR.
1

4 Elementary transconductor building blocks, resistors, integrators,
amplifiers, summers, gyrator, First and second order filters, higher order
filters.
2

5 Switched capacitor filters: The MOS switch, The switched capacitor,
first order building blocks, second order sections, sampled data
operation, Switched capacitor first and second order filters, Bilinear
transformation.
2

Text Book:
[1] Gobind Daryanani, "Principles of active network synthesis and design",John Wiley
and Sons.
[2. R.Schaumann, M.E.Van Valkenburg, "Design of analog filters", Oxford University
Press.

EC 024 SATELLITE COMMUNICATION

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I Elements of Satellite Communication
Orbital mechanics, look angle and orbit determination,
launches & launch vehicle, orbital effects Geostationary Orbit.

II Satellite subsystems, attitude and orbit control systems,
TTC&M, communication subsystem, satellite antenna
satellite link design: basic transmission theory, system

noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.
III Modulation and multiplexing techniques for satellite links: FM, pre-emphasis and de-emphasis, S/N ratios for FM video transmission, digital transmission, digital modulation and demodulation, TDM.
Multiple access: FDMA, TDMA, DAMA and CDMA.
IV Error control for digital satellite links: error detection and correction, channel capacity, error control coding, convolutional codes, linear and cyclic block codes.
Propagation effects and their impact on satellite-earth links: attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc.
V Introduction of various satellite systems: VSAT, low earth orbit and non-geostationary, direct broadcast satellite television and radio, satellite navigation and the global positioning systems.
Text / Reference Books:
1. Satellite Communications / Pratt, Bostian, Allnutt / John Wiley & Sons.
2. Satellite Communications / Dennis Roddy / McGraw-Hill
3. Digital Satellite Communications/ Tri T. Ha./ McGraw-Hill.

TEC-031 Embedded System

Unit Topic Lectures Book/
Chapter
1. Introduction: Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design
2. Hardware Fundamentals for the embedded developers Digital circuit parameters-Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's, Watchdog Timers, Hardware design and development.
3. Custom Single Purpose Processors: Optimizing program, FSMD, Data path &FSM.
4.General purpose processors and ASIP's (Application Specific Instruction set Programming): Software and operation of general purpose processors-Programmers View Development Environment-ASIPs Microcontrollers-DSP Chips.
5. Introduction to Microcontrollers and Micoprocessors, Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures.
6. 8051 Microcontrollers-Assembly language, architecture, registers, Addressing modes, Instruction set, I/O ports and memory organization Interrupts Timer/counter and serial communication.
7. RTOS-Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes.
8.Advanced Processor-(only architectures) 80386, 80486 and ARM (References) 2
5. 9. Communication basics, Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols.
10. Real world Interfacing: LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Key board, Latch Interconnection, PPI.
Text Books:
1. Embedded System Design-Frank Vahid/Tony Givargis, John Willey@2005.
2. Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw-Hill@2005.

3. An Embedded Software Primer-David E.Simon, Pearson Education @ 1999.
References:
1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
2. Microcontrollers (Architecture, Implementation & Programming) Kenneth Hintz, Daniel Tabak, Tata McGraw-Hill@2005.
3. 8051 Microcontrollers & Embedded Systems 2nd Edition-Sampath Kr, Katson Books@2006.

TEC-032 ADAPTIVE SIGNAL PROCESSING

1. Introduction: Definition and characteristics, general properties open and closed loop adaptation.
2. Adaptive Linear Combiner: General description, input signal and Weight vectors, desired response and error performance function, gradient and minimum mean square, alternative definition of gradient, decorelection of error and input components.
3. Theory of Adaptation with Stationary Signals: Input correlation matrix, Eigenvalues and eigenvectors of the correlation matrix, and their geometrical significance. Basic ideas of gradient search methods, gradient search by newton's method and method of steepest descent, gradient component estimation by derivative measurement, effects of gradient noise, on weight vector solution, excess MSE, time constant and misadjustment, performance comparison of Newton and S.D. methods.
4. Adaptive Algorithms: Least mean square algorithm, convergence, learning curve noise in Weight vector misadjustment and performances of LMS algorithms, sequential regression algorithm, adaptive recursive LMS algorithm, random search algorithm.
5. Recursive Least Square Algorithm: Preliminaries, matrix inversion lemma, exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS algorithm
6. Adaptive Filter Structures: Lattice structures, all poles and all zeroes versions, adaptive lattice predictor. Lattice LMS algorithms, and lattice SER algorithms, adaptive filters with orthogonal signals, DFT and lattice preprocessors.
7. Adaptive Filter Applications: (i) Adaptive modeling and systems identification. (ii) Inverse adaptive modeling, equalization and deconvolution

Text Books:

1. Adaptive Signal Processing, Widrow and Stearns, Pearson Education
2. Adaptive Filter Theory, Simon Haykin, Pearson Education

Reference Books

1. Adaptive Filters, Cowan & Grant, Prentice Hall
2. Theory and design of adaptive filters, John R. Treichler, PHI.
3. Adaptive Signal Processing by Davisson.

TEC-033 Reliability & Quality Management

I Introduction:
Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF.

II Reliability mathematics:
Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of probability, conditional probability, and random variables.
Probability distribution: Exponential distribution, gamma distribution, binomial distribution, normal distribution and weibull distribution.
III Reliability Data Analysis:
The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model.
System Reliability:
Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.
IV Electronics System Reliability:
Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.
V Quality management system & TQC:
Quality policy, cost & quality, concept of TQM, management of reliability & quality, elements of quality systems, essential steps in implementing quality system for ISO: 9000.

Text / Referencebook:

1. Practical Reliability Engineering/ *Patrick D.T., O'Connor* / John Wiley & Sons 4th edition).
2. Reliability Engineering/ *E. Balagurusamy* / Tata McGraw- Hill.
3. Quality control & Total quality Management / *P.L.Jain* / Tata McGraw- Hill.
4. Reliability and Maintainability Engineering / Charles E. Ebeling / TMH

TEC 034 BIOMEDICAL SIGNAL PROCESSING

1. Introduction to Bio-Medical Signals:
Classification, Acquisition and Difficulties during Acquisition.
2. Basics of Electrocardiography, Electroencephalography, Electromyography & electro-retinography
3. Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.
4. ECG: Measurement of Amplitude and Time Intervals, QRS Detection(Different Methods), ST Segment Analysis, Removal of Baseline Wander And Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.
5. Data Reduction: Turning Point algorithm, AZTEC Algorithm, Fan Algorithm,

Huffman and Modified Huffman Coding,
Run Length Coding.
6. EEG:Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation.
7. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, -Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, -Maximum Likelihood Method.
8. EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Canceling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.

TEXT BOOKS

1. Biomedical Digital Signal Processing, Willis J Tomkin, Phi.
2. Biomedical Signal Processing, D.C Reddy McGrawhill
3. Biomedical Instrumentation and Measurement.,Crommwell,Weibel and Pfeifer, PHI

REFERENCE BOOKS:

4. Biomedical Signal Processing, Arnon Cohen, volume I & Licrc Press
5 Biomedical Signal Analysis A Case Study Approach, Rangaraj M. Rangayyan, John Wiley and Sons Inc.
6. Medical instrumentation Application and Design, john G. Webster, john Wiley & Sons Inc.

TEC – 041 RANDOM SIGNAL THEORY

1 Theory of probability
Axioms of probability: set theory, probability space, conditional probability
Repeated Trials: Combined experiments, Bernoulli trials, Bernoulli's Theorem.
Concept of random variable: Introduction, distribution and density functions, specific random variables, conditional distributions.
Functions of one random variable: function and distribution of random variable, mean and variance, moments, characteristic functions.
Two random variables: Bivariate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions
Multiple random variables, sequences of random variables

Concept of stochastic processes: Definition, systems with stochastic inputs, power spectrum, discrete-time processes.
Random walks and other applications: random walks, Poisson poins and shot noise, cyclostationary processes, bandlimited processes and sampling theory, deterministic signals in noise.
Spectral representation and estmation: factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation
Mean square estimation: prediction, filtering and prediction, Kalman filters.
Entropy: Basic concepts, random variables and stochastic processes, MEM.
Markov chain: introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes.
Markov processes and Queueing theory: introduction, Markov processes, queueing theory.

Text / Reference Books

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai/4th ed./TMH
2. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr./TMH

TEC 042 VLSI DESIGN

1. Introduction to integrated circuit technology. CMOS fabrication, the p-well process, n-well process, twin tub process. Bi-CMOS technology. Basic electrical properties of MOS circuits, I_{ds}-V_{ds} relationship, MOS transistor threshed voltage V_t, Trans conductance and output conductance, MOS transistor figure of merit.
2. The n-MOS inverter, pull-up to pull-down ratio, CMOS inverter and its characteristics, latch –up in CMOS circuits, stick diagrams, n-MOS design style, CMOS design style, lambda based design rules , Body effect, sheet resistance, capacitances of layers, Gate delays, Delay estimation, logical efforts, Scaling models and scaling factors, limitation of scaling, , Limits of miniaturization.
3. n-MOS, CMOS NAND Gates, n-MOS, CMOS NOR gates. Combinational circuit design, sequential circuit design, design considerations, problems associated with VLSI Design, Design Methodology and Tools, Standard Cell Based Design, Design Flows, Automated Layout Generation, Placement, Floor planning, Routing, Parasitic Extraction, Timing Analyses.
4. Full Custom Design, Semi Custom Design, Programmable Logic structures, Field Programmable Gate arrays (FPGA) , Configurable Logic Block (CLB), Application-Specific Integrated Circuits (ASICs)
5. Design for Testability, Faults types and Models, Controllability and Observability, AD HOC Design Techniques, Scan-Based Techniques , Built-In self Test (BIST) Techniques, Current Monitoring I_{DDQ} Test. Packaging, Package Parasitics, Heat dissipation, Design Economics, Parametric yield.

Text Books:

1. Basic VLSI Design by Douglas A. Pucknell & Kamran Eshraghian, Prentice-Hall of India.
2. CMOS VLSI Design, A Circuits and Systems Perspective by Neil H.E. Weste, David Harris, Ayan Banerjee, Pearson Education.
3. CMOS Digital Integrated Circuits Analysis and Design by Sung-Mo Kang, Yusuf Leblebici. Tata Mc-Graw-Hill.

References:

1. Digital Integrated Circuits A Design Perspective by Jab M. Rabaey, Anantha Chandra kasan, Borivoje Nikolic, Prentice-Hall of India Pvt. Limited.
2. Principles of C-MOS VLSI Design A systems Perspective by Neil H.E. Weste, Kamrau Eshraghian, Pearson Education
3. Application-Specific Integrated Circuits by Michal John Sebastian smith, Pearson Education.

TEC043 Optical Networks

1. Introduction to Optical Networks
Characteristics of Optical Fiber (Emphasis on Non Linear Characteristics)
2. Components
Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers
Tunable Lasers
Switches, Wavelength Converters
3. Networks
SONET/SDH 1,
Multiplexing, SONET/ SDH Layers, Frame Structure, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure
ATM 1
Functions of ATM, Adaptation Layers, Quality of Service, Flow Control, Signaling and Routing
WDM Network Elements
Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects
4. WDM Network Design
Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks,
Network Survivability
Basic Concepts, Protection in SONET/SDH, Protection in IP networks, Optical Layer Protection, Different Schemes, Interworking between Layers
Access Networks
Network Architecture Overview, Enhanced HFC, FTTC,
5. Optical Switching
OTDM, Synchronization, Header Processing, Buffering, Burst Switching.
Deployment Considerations

Text Books:

1. Ramaswami, Rajiv & Sivarajan, Kumar N. / "Optical Networks a Practical perspective"/ Morgan Kaufmann Publishers / 2nd Ed.
2. Black, Uyless / "Optical Networks Third Generation Transport Systems"/ Pearson Educations

20

Reference Books:

1. Tanenbaum. Andrew S./ "Computer Networks"/ Prentice Hall (India)
2. Murthy, C. Siva Ram & Gurusamy, Mohan / "WDM Optical Networks Concepts, Design & Algorithms" / Prentice Hall (India)

TEC 044 Digital Image Processing

Unit Topic
Introduction: Fundamental steps in DIP, elements of DIP, Simple image model, Sampling & quantization, basic relationships between Pixels, Color image model.

Image Transforms: One-dimensional & Two-dimensional DFT, Cosine, Sine, Hadamard, Haar, and Slant & KL transforms.
1 &2
Image Enhancement: Introduction, Point operations, Histogram modeling, spatial operations, Transform operations.
3. Image Restoration: Introduction, Image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain,
4. Image Compression: Introduction, Pixel coding, Predictive coding, Transform coding, Interframe coding
5. Image Segmentation: Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.
Text Books:
1. Digital Image Processing, Rafael C. Conzalez Richard E Woods, 2nd Ed.
2. Fundamentals of Digital Image Processing, Anil K Jain.