

**COURSE CURRICULUM
FOR
UNDERGRADUATE PROGRAMME
B.E./B.TECH
IN
ELECTRONICS & COMMUNICATION ENGG.**



**FACULTY OF ENGINEERING & TECHNOLOGY
CHANDRA SHEKHAR AZAD UNIVERSITY OF
AGRICULTURE & TECHNOLOGY,
CAMPUS ETAWAH-206001**

Course Curriculum of B.Tech. (Mechanical Engineering)

Branch : Mechanical Engineering

Year:1

Semester-1 (Common to all branches)

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	HU 111	Professional Comm. I (common to all branches)	2	1	0	3
2.	CH 111	Engineering Chemistry-I	2	1	3*	4
3.	PH 111	Engineering Physics-I	3	1	3*	5
4.	MA 111	Mathematics-I	3	1	0	4
5.	CE 111	Engineering Mechanics	3	1	3**	5
6.	EE 111	Basic Electrical Engineering	3	1	3**	5
7.	CE 111	Engineering Graphics-I	0	0	3	1
8.	ME 111	Workshop Practices-I	0	0	3	2
9.	GP 111	GENERAL PROFICIENCY				2
Total			16	6	12	32

* To be taken in alternate weeks

** To be taken in alternate weeks

Total Periods : 34
Total Credits : 32

Branch : Mechanical Engineering

Year:1

Semester-II

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	HU 121	Professional Comm. II (common to all branches)	2	0	1	3
2.	CE-122	Environmental Studies	3	0	1	4
3.	CS-121	Introduction to computing	2	1	3	4
4.	CH-121	Engineering Chemistry-II (Environmental & Ecology)	2	1	0	3
5.	PH-121	Engineering Physics-II	3	1	0	4
6.	MA-121	Mathematics-II	3	1	0	4
7.	ME-121	Engineering Thermodynamics	3	1	0	4
8.	EC-121	Basic Electronics	3	1	3	5
9.	ME-122	Engineering Graphics-II (M/C Drawing)	0	0	3	2
11.	ME-123	Workshop Practice-II	1	0	2	2
10.	GP 111	GENERAL PROFICIENCY				2
Total			19	6	12	37

Total Periods : 37
Total Credits : 37

Branch : Electronics & Communication

Year:II

Semester-III

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	CS 231	Numerical Analysis & Computer Programming	2	1	3	4
2.	ME 231	Material Science	2	1	3*	4
3.	MA 231	Mathematics-III	3	1	0	4
4.	ME 232	Strength of Materials	3	1	3*	5
5.	EC 231	Switching & Pulse Theory	3	1	3	5
6.	EC 231	Electronics Measurements	3	1	3	5
10.	GP 231	GENERAL PROFICIENCY				2
Total			16	6	12	29

* To be taken in alternate weeks

Total Periods : 34

Total Credits : 29

Branch : Electronics & Communication

Year:II

Semester-IV

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	EC 241	Electromagnetic	2	1	0	3
2.	EC 242	Linear IC's and Applications	2	1	3	4
3.	EC 243	Electronics Circuits	3	1	3	5
4.	EC 244	Solid State Devices	3	1	3	5
5.	EE 241	Network Theory	3	1	3	5
6.	CS 241	Data Communication	3	1	0	4
7.	GP 241	GENERAL PROFICIENCY				2
Total			16	6	12	28

Total Periods : 34

Total Credits : 28

Branch : Electronics & Communication

Year:III

Semester-V

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	HU 351	Management Science	2	1	0	3
2.	EC 351	Electronics Instrumentation	2	1	3	4
3.	CS 351	Computer Organization	3	1	0	4
4.	EC 352	Communication Systems-I	3	1	3	5
5.	EC 353	Microprocessor Theory	3	1	3	5
6.	EE 351	Automatic Control Systems	3	1	3	5
7.	GP 241	GENERAL PROFICIENCY				2
Total			16	6	12	28

Total Periods : 34

Total Credits : 28

Branch : Electronics & Communication

Year:III

Semester-VI

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	EC 361	Industrial Electronics	2	1	0	3
2.	EC 362	Advanced Solid State Devices	2	1	0	3
3.	EE 361	Advanced Electric Circuits	3	1	3	5
4.	EC 363	Communication Hardware Design	3	1	3	5
5.	EC 364	Microwave Engineering	3	1	3	5
6.	EC 365	Communication System-II	3	1	3	5
7.	GP 361	GENERAL PROFICIENCY				2
Total			16	6	12	28

Note: Summer Field training of one credit (0-0-2) of four week is compulsory in this semester in the Month of June and evaluation of which will be carried out along with seventh semester.

Total Periods : 34
Total Credits : 28

Branch : Electronics & Communication

Year:IV

Semester-VII

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	EC 471	Optical Communication	3	1	3	5
2.	EC 472	Digital Signal Processing	3	1	3	5
3.	EC 473	Micro Electronics Devices and VLSI Technology	3	1	0	4
4.	OE 471	Open Elective-I	3	1	0	4
5.	EC 474	Professional Elective-I	3	1	0	4
6.	EC 475	Project-I	0	0	3	2
7.	CS 471	Computer Networking	0	0	3	2
8.	EC 476	Summer Field Training	0	0	2	1
	GP 471	GENERAL PROFICIENCY				2
Total			16	6	12	29

Total Periods : 34
Total Credits : 29

Branch : Electronics & Communication

Year:IV

Semester-VIII

Sl. No.	Course No.	Subject	Periods			Credits
			L	T	P	
1.	OE 481	Open Elective II	3	1	0	4
2.	EC 481	Professional Elective II	3	1	0	4
3.	EC 482	Professional Elective III	3	1	0	4
4.	EC 483	Digital Hardware Design	3	1	0	4
5.	EC 484	Satellite Communication	3	1	0	4
6.	EC 485	Project II	3	0	12	6
7.	GP 481	GENERAL PROFICIENCY				2
Total			15	5	12	28

Total Periods : 32
Total Credits : 28

HU 111 PROFESSIONAL COMMUNICATION – I 3(2-1-0)

Unit-I

Grammar & Composition-Articles, prepositions, spotting errors, Modals, foreign expression and their usage, Formation of nouns, adjectives, precis writing, paragraph writing.

Unit-II

Nature of communication- Process of communication, non verbal communication, business communication, barriers to communication, global aspects. Ethical aspects, legal aspects, accuracy, brevity, clarity and appropriateness in communication.

Oral presentation- Importance of acquiring oral presentation skills, body language, voice, modulation, audience awareness, presentation plan, visual aids, use of connectives, conducting a meeting, participating in a meeting.

Unit III

Report writing – structure of reports, front matter, main body, back matter.

Style of reports- Definition, the scientific attitude, readability of report, choice of words and phrases, construction and length of paragraphs and sentences.

Business correspondence- Memorandum, Notice, agenda, general principles of business correspondence, forms of business letters- indented form, block form, full- block form, semi block form, hanging indented form.

Unit-IV

- Study of selected literary texts
- Collection of short essays
- of studies- Francis Bacon
- A Bookish topic- RK Narayan
- Science & Human Life- JBS Haldane
- Water- CV Raman

Unit V

- Collection of short stories
- The barbar's trade union – Mulk Raj Anand
- The lament
- The gift of magi- O' Hanry
- The eyes are not here – Ruskin Sond
- Renunciation- Ravindra Nath Tagore
- The capital of the ward- Earnest Hemingway

Practical Aspects

Use of language laboratory to develop communication skills

Word accent- Production of correct accentual patterns involving two or three syllabic words

Intonation- Rising tone, and talking time, ear training, production tests.

Common errors- In articles, prepositions, conjunctions, connectives and other aspects of language and grammar, listing reading material, tables, spelling, semantics of connectives, modifiers and varieties in sentences and paragraphs.

Books recommended

1. Legget Glenn (etal), "Essentials of grammar and composition", Macmillan, Delhi.
2. Strunk, Jr. William, (etal), "The element of style", Macmillan, 1987.
3. Thomson and Martinat, "A practical book of english grammar", Oxford University Press, Delhi, 1985.
4. Bhaskar, W.W.S., and Prabhu, N.S>, "English Through Reading", Vol1&2 MacMillan, 1978.
5. D, Souza Eurince and Shahani, "Communication skills in english", Noble publishing house, 1997.

CH 111 ENGINEERING CHEMISTRY I 4(2-1-3*)

Atoms and Molecules

Particle in a box illustrating energy quantization, angular momentum quantization, radial and angular parts of H atom wave functions/orbitals, probability and charge distribution. Many electron atoms. Homonuclear and heteronuclear diatomic, covalent bonds, ionic bonds and electro negativity concepts, hybridization and shapes of molecules. Non-covalent interaction (Van Der Waals and hydrogen bonding).

Solid State

Idea of spatial periodicity of lattices; elements of bond theory. Conductors, semiconductors and insulators.

Experimental methods of structure determination using spectroscopic techniques such as IR, UV-Vis, NMR and Mass Spectrometry.

Reaction Dynamics

Rate laws, mechanisms and theories of reaction rates (collision and transition state theory). Lasers in Chemistry.

Electrochemistry

Application of electrode potentials to predict redox reactions in solution with special reference to Lattimer and Frost diagrams.

Transition Metal Chemistry

Structures of coordination compounds corresponding to coordination numbers up to 6. Types of ligands. Isomerism (geometrical, optical, ionization, linkage and coordination). Theories of bonding in coordination compounds, viz. crystal field theory, valence bond theory. Chelation. Brief application in organic synthesis and medicines etc.

Organ metallic Chemistry and Catalysis

Structure and bonding in organ metallic complexes, the sixteen and eighteen electron rules. Homogeneous catalysis, the role of metals in catalytic cycles during- some chemical reactions (e.g. hydroformylation, hydrogenation etc.). Role of metals in biology; oxygen carrier, electron transfer.

Structure and Reactivity of Organic Molecules

Inductive effect, resonance, hyper conjugation, electrometric effect. Carbonation, carbanion and free radicals. Brief study of some addition, elimination and substitution reactions. Conformational analysis (a cyclic and cyclic molecules), geometrical and optical isomerism; E, Z and R, S nomenclature.

Polymerization

Basic concepts, classification and industrial application.

Photochemistry

Photo excitation of carbon substrates (Noh-ish type I and type II reactions), selected examples of the application of photolysis. Photosynthesis (Z-diagram). Chemistry of vision. .

List of Experiments

- Acid-base titration (estimation of commercial caustic soda).
- Redox titration (estimation of iron using permanganometry).
- Complex metric titration (estimation of hardness of water using EDTA titration).
- Preparation and analysis of a metal complex (for example thiourea/copper sulfate or nickel chloride/ammonia complexes).
- Chemical kinetics (determination of relative rates of reaction of iodide with H_2O_2 at room temperature (clock reaction)).
- Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water).
- Photochemical oxidation-reduction (study of photochemical reduction of ferric salt).
- Viscosity of solutions (determination of percentage composition of sugar solution from viscosity).
- Synthesis of aspirin.
- Synthesis of p-nitro aniline from acetanilide.
- Detection of functional groups in organic compounds.
- Utilization of paper/thin layer/column chromatographic techniques in the separation of organic compounds.
- Radical polymerization of vinyl monomers such as styrene, acrylonitrile etc.
- Conductometric titration (determination of the strength of a given HCL solution by titration against a standard NaOH solution).

Suggested Text Books & References

1. "Blocks 1-5 of Chemistry Course", Indira Gandhi Open University, IGNOU, New Delhi, 1996.
2. Alberty, R.A., and Silbey, R. J., "Physical Chemistry", John Wiley & Sons, Inc., Singapore, 1996.
3. Cotton, F.A., Wilkinson, G., and Gaus, P. L., "Basic Inorganic chemistry", John Wiley & Sons, Inc., Singapore, 3rd Ed., 1996.
4. Graham-Solomon, T.W., "Fundamentals of Organic Chemistry", John Wiley & Sons, Inc., Singapore, 1997.
5. Odian, G.G., "Principles of Polymerization", John Wiley & Sons, Inc., New York, 1981.
6. Sykes, P., "A Guidebook to Mechanism of Organic Chemistry", Longman Inc., New York, 1981.
7. Dyer, J.R., "Application of Absorption Spectroscopy of Organic Compounds", Prentice Hall of India, 1965.
8. Williams D.H and Fleming; I., "Spectroscopic Methods in Organic Chemistry", Tala McGraw Hill Edition, New Delhi, 4th Ed., 1988.
9. Atkins, P.W. "Physical Chemistry", Oxford Univ. Press, 4th Ed., 1990.
10. Pine, S.H., "Organic Chemistry", McGraw Hill Book Co., New Delhi, 5th Ed., 1987.
11. Sharma, B.K., "Engineering Chemistry", Krishna Prakashan Media (P) Ltd., Meerut, 1996.
12. E.E. Conn and Stumpf, P.K. "Outlines of Biochemistry", Wiley Eastern Ltd., New Delhi, 4th Ed, 1985.
13. Morrison R.T and Boyd, R.N. "Organic Chemistry", Prentice Hall of India, 6th Ed., 1992.
14. Rao C.N.R. and Agarwala, U.C. "Experiments in General Chemistry", East-West Press, New Delhi, 1969.
15. Furnis, B.S., Hannaford, A.J. Smith P.W.G. and Tatchell, A.R., Vogel's "Textbook of Practical Organic Chemistry", ELBS, 5th Ed., 1989.
16. Vogel's "Textbook of Quantitative Analysis", Longman, New York, 4th Ed., 1978.
17. Elias, A.J. Sundar Manoharan S. and Raj, H. "Laboratory Experiments for General Chemistry", I.I.T. Kanpur, 1997.

PH 111 ENGINEERING PHYSICS-I 5(3-1-3*)**Theory of Relativity**

Inertial frame of reference, Noninertial frames and fictitious forces, Outline of relativity, Michelson-Morley experiment, Lorentz transformation of space and time, length contraction, variation of mass with velocity, equivalence of mass and energy.

Geometrical Optics

Combination of thin lenses, cardinal points of coaxial system of thin lenses, thick lenses, location and properties of cardinal points, graphical construction of images.

Physical Optics

Interference- analytical treatment of interference, intensity distribution of fringe system, coherent and non-coherent sources, fundamental conditions of interference, Fresnel's biprism, displacement of fringes, wedge shaped films, Newton's rings Diffraction- single slit and double slit diffraction, diffraction grating, Limit of resolution, resolving power of grating and image forming systems. Polarisation-Brewster's law, double refraction, geometry of calcite crystal, optic axis, nicol prism, circularly and elliptically polarised light, retardation plates, production and analysis of planes, polarimeter.

Thermal Physics

Kinetic theory of gases, maxwellian distribution, mean free path, transport phenomena in gases, Imperfect gases and vander Waal's equation of state.

Acoustics

Production and applications of Ultrasonics, Acoustics of buildings.

Dynamics of fluids

Continuity equation, Bernoulli's theorem and its applications, Torcelli's theorem, Viscosity, flow of liquid through a capillary tube, capillaries in series and parallel, stoke's formula, rotation viscometer.

List of Experiments

- To determine the coefficient of viscosity of water by capillary flow.
- To determine the thermal conductivity of a bad and good conductor by Lee's method and Searl's method, respectively.
- To determine the wave length of light by Newton's ring method.
- To determine the wave length of light by Fresnel's biprism.
- To determine the dispersive power of the given material of the prism.
- To determine the focal length of combination of two thin lenses by nodal slide assembly and its verification.
- Determination of e/m by J. J. Thomson's method.
- Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
- Use of Carry Foster Bridge. Study of electromagnetic induction.
- Study of electromagnetic damping and determination of terminal velocity reached by a magnet falling in a metallic tube.
- Study of LCR circuits with AC current.
- Determination of Plank's Constant using photocells.

Suggested Text Books & References

1. Jenkins and White, "Optics", McGraw-Hill Book Company.
2. Mathur, D.S., "Mechanics".
3. Saha and Srivastava "A Treatise on Heat".
4. Singh, R.B., "Physics of Oscillations and Waves".
5. Ghatak, A.K., "Optics".

MA 111 MATHEMATICS – I 4(3-1-0)**Calculus of Functions of One Variable**

Successive differentiation, Libnitz's theorem (without proof). Rolle's theorem mean value theorems and Taylor's theorem. Fundamental theorems of integral calculus, elementary reduction formulae for integrals. Applications to length, area, volume, surface area of revolution, moments and centers of gravity.

Infinite Series: Convergence, divergence, comparison test, ratio test, Cauchy Leibnitz's theorem, absolute and conditional convergence. Expansions of functions into Taylor and Maclaurin series.

Calculus of Functions of Several Variables

Partial derivatives, chain rule, gradient and directional derivative. Differentiation of implicit functions, exact differentials. Tangent planes and normals. Maxima, minima and saddle points. Simple problems in extrema of functions with constraints - method of Lagrange multipliers. Multiple integrals - double and triple integrals. Jacobians and transformations of coordinates. Applications to areas, volumes etc.

Vector Calculus

Scalar and vector fields. Line and surface integrals. Gradient, divergence and curl. Line integrals independent of path. Green's theorem, divergence theorem and Stoke's theorem (without proofs) and their simple applications...

Suggested Text Books & References

1. Thomas, G. B., and Finney, R. L., "Calculus and Analytic Geometry", 6th edition, Addison-Wesley/Narosa, 1985.
2. Piskunov, "Differential and Integral Calculus", Vol.-I & II, Mir Publishers, Moscow, 1979.

CE 111 ENGINEERING MECHANICS 5(3-1-3)**

Fundamental of Mechanics- Basic concepts**Force Systems and Equilibrium**

Force, Moment and couple, Principle of Transmissibility, Varignon's theorem, Resultant of force systems- Concurrent and non-concurrent coplanar forces, Free body diagram, Equilibrium equations and their uses in solving elementary engineering problems.

Plane Trusses

The structural model, simple trusses, analysis of simple trusses: method of joints, method of sections, graphical method.

Friction

Introduction, laws of coulomb friction, simple contact friction problems, belt friction, the square screw thread, rolling resistance.

Properties of Surface

First moment of an area and centroid, second moment and product of area of a plane area, transfer theorems, relation between second moment and product of area, polar moment of inertia, principal axes, mass moment of inertia.

Virtual Work

Work of a force, Principle of Virtual work and its application.

Kinematics of Rigid bodies

Plane motion, Absolute motion, Relative motion, Translating axes and rotating axes.

Kinetics of Rigid Bodies

Plane motion, Work and energy, Impulse and momentum.

List of Experiments

- To determine the Newton's second law of motion by Fletcher's trolley apparatus.
- To determine the moment of inertia of a flywheel about its axis of rotation.
- To verify: (a) the conditions of equilibrium of forces by parallel force apparatus. (b) The principal of moments by crank lever.
- To find the compression in the rafters and tension in ties of simple roof truss models and to verify graphically.
- To determine the dry friction between inclined plane and slide boxes of different materials.
- To determine the coefficient of friction between the belt and rope and the fixed pulley.
- To determine the velocity ratio of a simple screw jack and to plot graph between (a) Effort-Load. (b) Friction-Load. (c) Efficiency-Load.
- To measure the area of a figure with the help of a Polar Planimeter.

Suggested Text Books & References

1. Beer, F.P., and Johnston, F. R., "Mechanics for Engineers", McGraw Hill.
2. Shames, I.H., "Engineering Mechanics", Prentice Hall of India.
3. Meriam, J.L., "Statics", John Wiley.
4. Meriam, J.L., "Dynamics", John Wiley.

EE 111 BASIC ELECTRICAL ENGINEERING 5(3-1-3)**

DC Networks

Kirchoff's laws, node voltage and mesh current methods; Delta-star and star-delta conversion; Classification of Network Elements, Superposition principle, Thevenin's and Norton's theorems.

Single Phase AC Circuits

Single phase EMF generation, average and effective values of sinusoids; Solution of R, L, C series circuits, the j operator, complex representation of impedances; Phasor diagram, power factor, power in complex notation; Solution of parallel and series-parallel circuits; Resonance.

Three phase AC Circuits

Three phase EMF generation, delta and Y-connection, line and phase quantities; Solution of three phase circuits, balanced supply voltage and balanced load; Phasor diagram, measurement of power in three phase circuits; Three phase four wire circuit; Unbalanced circuits.

Magnetic Circuits

Ampere's circuital law, B-H curve, solution of magnetic circuits; Hysteresis and eddy current losses; relays an application of magnetic force.

Transformers

Construction, EMF equation, ratings; Phasor diagram on no load and full load; Equivalent circuit, regulation and efficiency calculations; Open and short circuit tests; Auto-transformers and three phase transformers.

Induction Motors

The revolving magnetic field, principle of operation, ratings: Equivalent circuit; Torque-speed characteristics; Starters for squirrel cage and wound rotor type induction motors; Single phase induction motors.

DC Machines

Construction, EMF and torque equations; Characteristics of DC generators and motors; Speed control of DC motors and DC motor starters; Armature reaction and commutation.

Electrical Measuring Instruments

DC PMMC instruments, shunts and multipliers, multi-meters; Moving iron ammeters and voltmeters; Dynamometer wattmeters; AC watt-hour meters, Extension. of instrument ranges.

Power Supply Systems

General structure of electrical power systems; Power transmission and distribution via overhead lines and underground cables, Steam, hydro, gas and nuclear power generation.

List of Experiments

- To measure the armature and field resistance of a DC machine.
- To calibrate a test (moving iron) ammeter, and a (dynamometer) wattmeter with respect to standard (DCPMMC) ammeter and voltmeters.
- Verification of circuit theorems, Thevenin's and Superposition theorems (with DC sources only).
- Voltage-current characteristics of incandescent lamps and fusing time-current characteristics of fuse wire.
- Measurement of current, voltages and power in R-L-C series circuit excited by (single phase) AC supply.
- Open circuit and short circuit tests on a single-phase transformer.
- Connection and starting of a three-phase induction motor using direct on line (DOL), or star-delta starter.
- Connection and measurement of power consumption of a fluorescent lamp.
- Determination of open circuit characteristics (GCC) of a DC machine.
- Starting and speed control of a DC shunt motor.
- Connection and testing of a single-phase energy meter (unity power factor load only).
- Two-wattmeter method of measuring power in three-phase circuit (resistive load only).
- Measurement of thermo emf between different types of thermocouples as a function of temperature difference between the junction, measurement of an unknown temperature.
- Design and use of potentiometer.
- Study of LCR circuits with AC current.

Suggested Text Books & References

1. Hughes Edward (revised by Ian McKenzie Smith), "Electrical Technology", Seventh Edition, English Language Book Society Publication with Longman, 1995.
2. Del Torro, Vincent "Electrical Engineering Fundamentals", Second- Edition, Prentice Hall of India Pvt. Ltd., 1994.
3. Cotton, H., "Advanced Electrical Technology", Issac Pitman, London, 1967.
4. Wildi, Theodore "Electrical Machines, Drives and Power Systems", Second Edition, Prentice Hall, 1991.
5. Cogdell, J R "Foundations of Electrical Engineering", Second Edition, Prentice Hall, 1996.
6. Parker Smith S. (Ed. Parker Smith N N), "Problems in Electrical Engineering", Tenth Edition, Asia Publications, 1995.

CE 112

ENGINEERING GRAPHICS-I

2(0-0-3)

General

Importance, Significance and scope of engineering drawing, Lettering, Dimensioning, Scales, Sense of proportioning, Different types of projections, Orthographic projections, B.I.S. Specifications.

Projections of Points and Lines

Introduction of planes of projection, Reference and auxiliary planes, projections of points and lines in different quadrants, traces, inclinations, and true lengths of the lines, projections on auxiliary planes, shortest distance intersecting and nonintersecting lines.

Planes Other than the Reference Planes

Introduction of other planes (perpendicular and oblique), their traces, inclinations etc., projections of points and lines lying in the planes, conversion of oblique plane into auxiliary plane and solution of related problems.

Projections of Plane Figures

Different cases of plane figures (of different shapes) making different angles with one or both reference planes and lines lying in the plane figures making different given angles (with one or both reference planes). Obtaining true shape of the plane figure by projection.

Projection of Solids

Simple cases when solid is placed in different positions, Axis, faces and lines lying in the faces of the solid making given angles.

Development of Surface

Development of simple objects with and without sectioning.

Isometric Projection

Nomography**Basic concepts and use.****Suggested Text Books & References**

1. Narayana, K.L. and Kanniah, P. "Engineering Graphics.", Tata McGraw Hill, New Delhi, 1988.
2. Bhatt, N.D. "Elementary Engineering Drawing", Charotar Book Stall, Anand, 1998.
3. Lakshminarayanan, V. and Vaish Wanar, R.S., "Engineering Graphics", Jain Brothers, New Delhi, 1998.
4. Chandra, A.M. and Chandra Satish, "Engineering Graphics", Narosa, 1998.

ME 111 WORKSHOP PRACTICE I 2(0-0-3)**Carpentry Shop**

- Study of tools & operations of a carpentry joints.
- Simple exercise using jack plain.
- Prepare half lap corner joints, mortise & tenon joints.
- Simple exercise on wood working lathe.

Fitting Shop

- Study of tools & operations.
- Simple exercise involving fitting work.
- Making perfect male – female joints.

Black Smithy Shop

- Study of tools & equipments.
- Simple exercises based on black smithy operation such as upsetting, drawing down, punching, bending, fullering, swaging.

Welding Shop

- Study of tools & operations.
- Preparation of simple butt & lap joint.
- Oxy-acetylene welding.

Sheet Metal Shop

- Study of tools & operations.
- Making funnel complete with soldering.
- Fabrication of toolbox, tray, electrical panel boxes etc.

Machine Shop

- Study of tools & operations.
- Plane turning, step turning, taper turning, threading.
- Single point cutting tool grinding.

Suggested Text Books & References

1. Begeman, M.L.. and Amstead, B.H. "Manufacturing Process", John Wiley, 1968.
2. Chapman, W .A.J. and Arnold, E. "Workshop Technology", Vol. I & III, Viva Low Priced Student Edition, 1998.
3. Raghuwanshi, B.s. "Workshop Technology", Vol. I & II, Dhanpat Rai and Sons, 1998.
4. Chaudhary, Hajra "Elements of Workshop Technology", Media Promotors & Publishers, 1997.
5. Crawford, S. "Basic Engineering Processes", Hodder & Stoughton, 1985.

HU 121 PROFESSIONAL COMMUNICATION – II 3(2-0-1)**Unit-I**

Technical written communication- Nature origin and development of technical communication, salient features, chief characteristics of technical writing, basic difference between technical writing and general writing, Role of diction in technical writing and general writing.

Unit II

The salient features of scientific and technical communication

1. Fragmented sentences
2. Parallel comparisons
3. Squinting construction and split infinitive
4. Dangling Participles and gerunds
5. Coherence, unity, chronological, method, spatial method, inductive method, deductive method.

Unit III

Proposal writing- Types of proposals, The chief characteristics of a good proposal, structure or format of proposal the deference between a report and a proposal.

Writing scientific and semi-technical articles- Tables, figures, footnotes, bibliography, pie graphs, bar charts, flow charts, line graphs.

Unit IV

Study of scientific and general tests- Arora, V.N., “ Improve your writing “ Delhi; Oxford University press, 1981.

1. The effect of the scientific temper on Man –Bertrand Russell.

2. Technological Ombudsman-Alvin Toffler.
3. Population Explosion – Robert Arvill
4. The Scientist and Poet-D.G. King – Hele
5. The Language of literature and science-Aldous Huxley
6. The aims of science and the humanities – MoodyE.
7. The mother of the science- A.J. Bahm
8. The progress in the arts and science-Bronowski

Unit V

Phonetic Transcription – The definition , Broad phonetic transcription, narrow phonetic transcription, Diphthong, plosives, Fricatives, Lateral

Practical Aspects- Listing comprehension

- a. Ear Training
- b. Uses of latest scientific techniques (AVR comprehension training) comprehension accelerator, AVR comprehension reteometer.

Reading comprehension- Reading at various speeds, slow, fast, very fast, reading different kinds of texts for different purposes (for example, for relaxation, for information, for discussion at a later stage etc.)

Speaking- Achieving desired clarity and fluency, manipulating, paralinguistic features of speaking voice quality pitch tone, pausing for effectiveness, while speaking , making a short class room presentation,

Group Discussion- Use of persuasive strategies including rhetorical devices (for emphasizing , for instance , being polite and firm; handling question and taking in criticism of self ; term taing strategies and effective intervention using body language.) .

Books Recommended

1. Fiske, John, “ Introduction to communication studies”, Rotledge London, 1990
2. Gartside, I “ Modal Business letter” , Pitman London, 1992
3. Nurnberg. Maxwell and Morris, Rosen Blum. “ All about words”, General book report, New Delhi, 1995
4. O. Cooner, JD. “ Better english pronunciation”, Oxford University press, 1992.

CE 122 ENVIRONMENTAL STUDIES 4(3-0-1)

Unit 1: The Multidisciplinary nature of environmental studies (2 lectures)

Definition, scope and importance

Need for public awareness

Unit 2; Natural Resources (8 lectures)

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 problems, changes caused by agricultural 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, sue of alternate energy sources. Case studies.
 - f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conserve of natural resources.
 - Equitable use of resources for sustainable lifestyles.

Unit 3: Ecosystems (6 lectures)

- 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 pyran.
- 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 4 : Biodiversity and its conservation (8 lectures)

- 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 and Ex-situ conservation, of biodiversity.

Unit 5: Environmental Pollution

(8 lectures)

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.
- Disaster management: Floods, earthquake, cyclone and landslides.

Unit 6: Social Issues and the Environment

(7 lectures)

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, water and management
- Resettlement and rehabilitation of people; its problems and concerns. Case studies.
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
- 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

Unit 7 : Human Population and the Environmental

(6 lectures)

- Population growth, variation among nations.
- Population explosion-Family Welfare Programme.
- Environmental and human health.
- Human Rights.
- Value Education.
- HIV/AIDS
- Women and Child Welfare
- Role of Information Technology in Environmental and human health
- Case Studies.

Unit 8 : Field work

(5 lectures)

- Visit to a local area to document environmental assets-rive/forest/grassland/hill mountain.
- Visit to a local pollution site-Urban/rural/Industrial/Agricultural.
- Study of common plants, insects, birds.
- Study of simple ecosystems-pond, river, hill slopes, etc. (Field work Equal to 5 lecture hours)

References:

1. Agarwal. K.C. 2001. Environmental Biology, Nibi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India. Mapin Publishing Pvt. Ltd. Ahmedabad-3080 013, India, Email : mapin@icenet.net (R)
3. Brunner R.C., 1989. Hazardous Waste Incineration. McGraw Hill Inc. 480p.

4. Clark R.S., Marine Pollution, Clarendon Press Oxford (TB)
5. Cunningham, W.P. Copper, T.H. Gorhani, E & Hepworth, M. T. 2001 Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
6. De. A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environmental (R)
8. Gleick, H.P. 1993. Water in crisis, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute. Oxford Univ. Press 478p.
9. Hawkins R.E. Encyclopedia of India Natural History, Bombay natural history Society, Bombay (R)
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment. Cambridge Univ. Press 1140 p.
11. Jadhav, H. & Bhosale, V.m. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
12. McKinney, M.L. & Schoeb, R.M. 1996 Environmental Science system & Solutions, Web enhanced edition 639p.
13. Mhaskar A.K. Matter Hazardous. Techno-Science Publications (TB)
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB)
15. Odum, E.P. 1971. Fundamentals of Ecology. W.B. Saunders Co. USA, 574p.
16. Rao M.N. & Datta, A.K. 1987. Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
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 Muirhead Begon, Essentials of Ecology, Blackwell Science (TB).
20. Trivedi R.K. Handbook of Environmental laws, Rules, Guidelines, Compliances and Standards Vol. I & II, Enviro Media (R)
21. Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications (TB)
22. Wagner K.D., 1998. Environmental Management n.B. Saunders Co. Philadelphia, USA 499p.
(M) Magazine (R) Reference (TB) Textbook

CS 121 INTRODUCTION TO COMPUTING 4(2-1-3)

Introduction

Introduction to the computer devices such as keyboard, mouse, printers, disk, files, floppies, etc. Concept of computing, contemporary, OSs such as DOS, Window 95, MAC-OS, UNIX, etc. (Only brief user level description). Introduction to the e-mail, ftp, rlogin and other network services, world wide web. Introduction to the typesetting softwares such as Microsoft office.

Introduction to Programming

Concept of algorithms, Example of Algorithms such as how to add ten numbers, roots of a quadratic equation. Concept of sequentially following up the steps of the algorithm. Notion of program, programmability and programming languages. Structure of programs, object codes, compilers. Introduction to the Editing tools such as vi or MS- VC editors. Concepts of the finite storage, bits, bytes, kilo, mega and gigabytes. Concepts of character representation. Languages for system programming: study of Basics, Fortran, Pascal, Cobol etc.

Computer Programming Lab

- Concepts of flow charts and decision tables, Examples and practice problems.
- Introduction to Digital computers and its components, Introduction to DOS and UNIX operating systems.
- Development of computer program for example
- Roots of quadratic and Cubic equations
- Summation of N natural numbers
- Arranging numbers in ascending and descending orders
- Separation of odd and even numbers, etc.

Suggested Text Books & References

1. Kernighan, B.W., "The Elements of Programming Style", McGraw-Hill.
2. Yourdon, E., "Techniques of Program Structures and Design", Prentice-Hall.
3. Press, W.H., Teukolsky, S.A., Vetterling, W.T., & Flannery, B.P., " Numerical Recipes in Fortran", Cambridge university press.
4. Gotterfried, B.S. " Schaum's Outline of Theory & Programming With Basic", McGraw Hill, New Delhi.
5. Schied, F.S., " Theory and Problems of Computers & Programming", McGraw Hill New Delhi.
6. Divakar Singh & Bajpayee, "Computer & Programming Language", New Age Publication.
7. Divakar Singh, "Foundation of Information Technology", New Age Publication.

CH 121 ENGINEERING CHEMISTRY II (ENVIRONMENT AND ECOLOGY) 3(2-1-0)

General

Introduction, components of the environment, environmental degradation.

Ecology

Elements of Ecology: Ecological balance and consequences of change, principles of environmental impact assessment.

Air Pollution and Control

Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer; standards and control measures.

Water Pollution and Control

Hydrosphere, natural water, pollutants their origin and effects, river/lake/ ground water pollution, standards and control.

Land Pollution

Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes): their origin and effects, collection and disposal of solid waste, recovery and conversion methods.

Noise Pollution

Sources, effects, standards and control.

Books & References

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. Nebel, B.J., "Environmental Science", Prentice-Hall Inc., 1987.
3. Odum, E.P, "Ecology: The Link Between The Natural and Social Sciences", IBH Publishing Com. Delhi.

PH 121**ENGINEERING PHYSICS-II****4(3-1-0)****Vector analysis**

Scalar and vector fields, gradient of a scalar field, Divergence and curl of a vector fields, Line integral of a vector field, Gauss- divergence theorem, Stoke's theorem

Electromagnetism

Quantization & conservation of charge, Coulomb's law (vectorial form) and superposition principle, Concept of electric field lines, flux of E-field, Gauss' law, Electric Potential energy and potential, Conductors, capacitors and dielectric materials, Magnetic field, Force on a moving charge in a magnetic field, Force on current element, Torque on current loop, Biot-Savart law, Ampere's law, Electromagnetic induction and Faraday's law, Magnetism in materials, Maxwell's, equations, Electromagnetic Waves.

Thermoelectricity

Seebeck effect, law of successive temperatures, law of intermediate metals, peltier effect, Thomson effect, Thermoelectric power, application of thermodynamics on thermocouple.

Modern Physics

Elements of wave properties of particles and particle properties of waves, Nuclear Energy, Lasers- spontaneous and stimulated emission of radiation, Einstein coefficient, Parts of laser, types of lasers and their application.

Solid State Devices

Energy band diagram; covalent bonds; bound and free electrons, holes; electron and hole mobilities; intrinsic and extrinsic semiconductors; Fermi and impurity levels; impurity compensation, charge neutrality equation and semiconductor conductivity; Einstein relation; drift and diffusion current; photo conductivity and Hall effect.

Suggested Text Books & References

1. Rangwala and Mahajan "Electricity and Magnetism", Tata McGraw Hill, 1998.
2. Verma, H.C., "Concepts of Physics, Part-2", Bharati Bhawan (P&D),.1998.
3. Beiser, "Modern Physics", McGraw-Hill Inc., New York, 1995.
4. Mani and Mehta, G.K., "Modern Physics", Affiliated East-West Press Pvt. Ltd,1998.

MA 121**MATHEMATICS – II****4(3-1-0)****Linear Algebra**

Vector spaces-linear independence and dependence of vectors, inner Products, linear transformations. Matrices and determinants. Systems of linear equations-consistency and inconsistency. Gauss elimination, rank of a matrix, inverse of a matrix. Eigenvalues and eigenvectors of a matrix, diagonalization of a matrix.

Ordinary Differential Equations

Formation of ODE's, definition of order, degree and solutions. ODE's of first order: separable variables, homogeneous and nonhomogeneous equations; exactness and integrating factors, linear equations and Bernoulli equations. General linear ODE's of nth order: solutions of homogenous and nonhomogenous equations, operator method, methods of undetermined coefficients and of variation of parameters. Solutions of simple simultaneous ODE's.

Laplace Transforms

Transforms of elementary functions, transforms of derivatives and derivatives of transforms, inverse transforms, transforms of periodic functions, unit step function, shifting theorems, solutions of ODE's using Laplace transforms.

Numerical Methods

Difference operators-forward, backward, central, shift and average operators and relations between them. Newton's forward and backward interpolation: Lagrange interpolation and the error formula for interpolation. Numerical differentiation and integration-Trapezoidal rule and Simpson's one-third rule including error formulas.

Suggested Text Books & References

1. Kreyszig, E., "Advanced Engineering Mathematics", 5th Ed., Wiley Eastern, 1985.
2. V. Krishnamurthy, V., Mainra, V.P., and Arora, J.L. "An Introduction to Linear Algebra", Affiliated East-West, 1976.
3. Boyce and DiPrima, R.C., "Elementary Differential Equations and Boundary Value Problems", 3rd Ed., Wiley, 1977.

ME 121 ENGINEERING THERMODYNAMICS 4(3-1-0)

Fundamentals and Definitions System, Control Volume, properties, state, state change, and diagram, Dimensions and units. Work Mechanics and Thermodynamics definitions, Displacement work at part of a system boundary, Engine Indicator, Displacement work in various quasi-static processes, shaft work, electrical work Heat Temperature, thermal equilibrium, Zeroth law of thermodynamics, sign convention for heat transfer. First Law of Thermodynamics Statement, Application to noncyclic process, Energy, modes of energy, Pure substance, Specific heats, First Law for Control Volumes. Second Law of Thermodynamics Direct and reversed heat engines, Kelvin-Planck and Clausius Statements and their equality, reversible and irreversible processes, Carnot cycle, Thermodynamic temperature scale. Entropy Definition, calculation through T ds relations, T -s diagrams, entropy as a measure of irreversibility Properties of pure substances - Use of steam Tables and Mollier Diagram. Ideal gas Properties of ideal gas and ideal gas mixtures with and without a condensable vapour-psychrometry. Real gas, Equations of state, generalised charts for compressibility, enthalpy changes and fugacity. Second Law Analysis of Engineering Processes Availability and irreversibility and their application in Thermal Engineering.

Suggested Text Books & References

1. Spalding, D. B. and Cole, E.H., "Engineering Thermodynamics", Edward Arnold, 1959.
2. Hawkins, G.A., "Engineering Thermodynamics", John Wiley and Sons, 1955.
3. Van Wylen, G. J. and Sonntag, R.E., "Fundamentals of Classical Thermodynamics", John Wiley and Sons, 4th edition, 1997.
4. Nag, P.K., "Engineering Thermodynamics", Tata McGraw Hill, 2nd edition, 1998.
5. Onkar Singh, & Chandra, "Introduction to Mechanical Engineering – Engineering Thermodynamics & Strength of Material", New Age Publication.

EC 121 BASIC ELECTRONICS 5(3-1-3)

Semiconductor Diodes Introduction, Ideal diode, PN semiconductor diode, Diode equivalent circuits, Zener diode, Light diodes. Bipolar Junction Transistor Introduction, Transistor construction, Transistor operation, Common-base configuration, common emitter and common collector configuration. Field Effect Transistor Introduction, Construction, and characteristics of JFETs, Transfer characteristics, Depletion type MOSFET, Enhancement type MOSFET. Operational Amplifier Introduction, Differential and common mode operation, Constant gain' multiplier, voltage summing, voltage buffer. Semiconductor Devices Introduction of silicon controlled rectifier, GTO, TRIAC, DIAC, .injunction transistors: IGBT. Cathode Ray Oscilloscope Introduction, Cathode ray tube- theory& construction. Electronic Instruments Introduction, Electronic voltmeters, Vacuum type voltmeters, Differential amplifiers, D.C. Voltmeter with direct coupled amplifier, Electronic multimeter. Transducers Introduction, classification and types of electrical transducers. Display Devices and Recorders Introduction, Digital instruments, Digital V s Analog instruments, Recorders- Analog recorders, graphic recorders, strip chart recorders. Data Acquisition Systems Introduction, Components and uses.

BASIC ELECTRONICS LAB

- Characteristics Curve for common base emmitor & common collector transducers.
- Characteristics of field effect transistors.
- Verification of properties of operational amplifiers.
- Study of CRO.
- Study of working of data acquisition system.

Suggested Text Books and References

1. Robert Boylestad & Louis Nashelsky, "Electronic Devices & Circuit Theory", Prentice Hall of India.
2. Milliman & Halkias, "Basic Electronics Principle".
3. Sawhney, A. K., "Electrical & Electronics Measurement and Instrumentation", Dhanpat Rai & Sons.

ME 121 ENGINEERING GRAPHICS-II (M/C DRAWING) 2(0-0-3)

Basic Concepts

I. S. drawing-conventions, line symbols, kinds of line, drawing sheet lay-out, rules of printing, preferred scales.

Projections

Perspective, orthographic, isometric and oblique projections, isometric scale, isometric drawing. Technical sketching.

Shape Description (External)

Multiplanar representation in first- and third angle systems of projections, glass-box concept, sketching of orthographic views from pictorial views, precedence of lines.

Sketching of pictorial (isometric and oblique) views from Multiplanar orthographic views. Reading exercises. Missing line and missing view exercises.

Shape Description (Internal)

Importance of sectioning, principles of sectioning, types of -sections, cutting plane representation, section lines, conventional practices.

Size Description

Dimensioning, tools of dimensioning. Size and location dimensions. Principles and conventions of dimensioning. Dimensioning exercises.

Computer Aided Drafting

Basic concepts and use.

Suggested Text Books & References

1. French and Vireck, "The fundamental of Engineering Drawing and Graphic Technology", McGraw Hill, 4th Ed., 1978.
2. "IS: 696 (1972) Code of Practice for General Engineering Drawing", ISI New Delhi.
3. P.S. Gill, "A Text Book of Machine Drawing", Katson Publishing House, Ludhiana, 1980.
4. Giesecke, Mitchell, Spener, Hill and Dygon, "Technical Drawing", McMillan & Co., 7th Ed., 1980.
5. George Omura, "Mastering AUTOCAD", B.P.B. Publication; New Delhi, 1994.

ME 122 WORKSHOP PRACTICE II 2(1-0-2)

Carpentry

Timber, seasoning and preservation, plywood and ply boards. Engineering applications.

Foundry

Moulding sands, constituents and characteristics, pattern, materials, types, core prints. Role of gate, runner, riser, core and chaplets, causes & remedies of some common casting defects like blow holes, cavities and inclusions.

Metal Joining

Definitions of welding, brazing & soldering processes; and their applications. Oxy-acetylene gas welding processes, equipments, techniques, type of flames; and their applications. Manual metal arc welding technique and equipment, AC and DC welding electrodes, constituents and functions of electrode coating. Welding positions. Type of welding joints. Common welding defects such as cracks, undercutting, slag inclusions, porosity.

Metal Cutting

Introduction to machining and common machining operations. Cutting tool material. Definitions of machine tools, specification and block diagram of lathe, shaper, drilling machine and grinder. Quick return mechanism of shaper. Difference between drilling and boring. Files material and classification.

Forging

Forging principle, materials, operations like drawing, upsetting, bending and forge welding, use of forge parts.

List of Practical

Carpentry Shop

- Preparation of cross lap joints.
- Preparation of bridle joints.

Fitting Shop

Simple exercising involving filing, drilling, tapping and dieing.

Foundry Shop

- Mould of any pattern.
- Casting of any simple pattern.

Machine Shop

Job on lathe with plane turning, taper turning, step turning, chamfering, threading. Study of drilling, grinding; and shaping machine.

Welding Shop

- Preparation of square butt joints by MMA welding.
- Prepare lap joint MMA welding.

CS 231 NUMERICAL ANALYSIS & COMPUTER PROGRAMMING (C, C++) 5(3-1-3)

I. Numerical Analysis

Approximations and round of errors, Truncation errors and Taylor Series, Determination of roots of polynomials and transcendental equations by Newton-Raphson, Secant and Baisrow's method. Solutions of linear simultaneous linear algebraic equations by Gauss; Elimination and Gauss- Siedel iteration methods. Curve fitting- linear and nonlinear regression analysis. Backward, Forward and Central difference relations and their uses in Numerical differentiation and integration, Application of difference relations in the solution of partial differential equations. Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.

II. Computer Programming

Introduction to computer programming in C and C++ languages. Arithmetic expressions, Simple programs. The

emphasis should be more on programming techniques rather than the language itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials. Example of some simple C program. Dissection of the program line by line. Concepts of variables, program statements and function calls from the library (printf for example) C datatypes, int, char, float etc. C expressions, arithmetic operations, relational and logic operations. C assignment statements, extension of assignment to the operations. C primitive input output using getchar and putchar, exposure to the scanf and printf functions. C statements, conditional execution using if, else. Optionally switch and break statements may be mentioned. Concepts of loops, example of loops in C using for, while and do-while. Optionally continue may be mentioned. One dimensional arrays and example of iterative programs using arrays, 2-d arrays. Use in matrix computations. Concept of Sub-programming, functions. Example of functions. Argument passing mainly for the simple variables. Pointers, relationship between arrays and pointers. Argument passing using pointers. Array of 'pointers, Passing arrays as arguments. Strings and C string library. Structure and unions. Defining C structures, passing structures as arguments. Program examples. File I/O. Use of fopen, fscanf and fprintf routines.

List of practical

Development of computer program for

- Numerical integration by Trapezoidal and Simpson's rule.
- Gauss-Siedel iteration method.
- Various matrix operation and their use as sub-routines

Suggested Text Books & References

1. Shastri, S.S., "Numerical Methods", Prentice Hall Inc., India, 1998.
2. Noble Ben, "Numerical methods", New York International Publications, New York, 1964.
3. Stanton Ralph G., "Numerical Methods for Engineering", Englewood Cliffs, N.J., Prentice Hall Inc., 1961.
4. Buckingham R.A., "Numerical Methods", Sir Isaac Pitman Sons. Ltd., London, 1957.
5. Bakhvalov, N.S., "Numerical Methods", Mir. Pub., Moscow, 1977.
6. Grewal, B.S., "Numerical Methods", Khanna Pub., New Delhi, 1998.
7. Sudhit Kaicker, "The Complete ANSi C", BPB Publications, New Delhi, 1996.
8. Kernighan, B.W. and D.M. Ritchie, "The C Programming Language", Prentice Hall of India, 1998.
9. Byron, S. Gottfreid, "Programming with C", Tata McGraw Hill, 2nd edition 1998.
10. Divakar Singh & Girish Chandra, "Computer Numerical Analysis", New Age Publication.

MATERIAL SCIENCE

Crystal Structures

Space lattice and crystal structures, Determination of Crystal structure by X-ray technique, imperfections in crystals like point, line and planar defect influence of imperfections on properties of materials, Dislocation multiplication. Diffusion, Mechanisms, Laws and applications..

Behaviour of Materials

Elastic, inelastic and viscoelastic behaviour of materials, plastic deformation, hardening, Yield point phenomena, Ductile and brittle fracture.

Mechanical Properties of Materials

Tensile and compression test, shear test, fatigue test, hardness test, impact test, Creep strength of materials.

Dielectric Materials

Principles, temperature and frequency effects, ferroelectric materials,

Polymers

Types, properties, additives, application.

Material Science Lab

- To study the lattice structure of various types of unit Cells. Observe the Miller Indices for various Planes and directions in a unit Cell.
- To study the micro-structure of Cast Iron, Mild Steel, Brass, Solder
- Under Annealed, Cold Worked, forged/rolled conditions.

- To verify the Hall effect.
- To determine the fracture characteristics of ductile and brittle materials.
- To determine the chemical composition of a few common alloys.
- To determine %age of C and S content in an alloy with Fe as main constituent.
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Suggested Text Books & References

- Vlack, Van, "Material Science for Engineers"
- Raghavan, V., "Material Science and Engineering", Prentice Hall.
- Callister, "Material Science and Engineering", Astern Wiley.

MATHEMATICS-III

Fourier Series

Fourier series, Half-range series, Harmonic analysis.

Solution in Series

Differentiation and integration of Infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials.

Complex Variables

Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy—Riemann equations, conjugate functions; Application to two dimensional potential problems; Conformal transformations, Schwartz-Christoffel transformation; Cauchy's Integral theorem, Taylor's and Laurent's expansions; Branch points, zeros, poles and residues; Simple problems on contour integration.

Boundary Value Problems

Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables.

Integral Transforms

Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to one-dimensional problems.

Suggested Text Books & References

- Npiskunov, S., "Differential and Integral Calculus", Vol. I & II, Mir Publishers, Moscow, 1979.
- Churchill, R.V., "Fourier Series and Boundary Value Problems", Mc Graw Hill, 1963.
- Sneddon, I. N., "Fourier Transforms", Mc Graw Hill, 1951.
- Churchill, Brown and Verhey, "Complex Variables and Applications", McGraw Hill, 1997.
- LePage, W.R., "Complex Variables and The Laplace Transform for Engineers", McGraw Hill, 1961.
- Markushevich, A.I., "The Theory of Analytic Functions", Mir Publishers, Moscow, 1983.

STRENGTH OF MATERIALS

Analysis of Stresses

Body forces, Surface forces, Internal Force, Stress at a point, Components of stress in Rectangular coordinates, Stress tensor, Principal stresses, Transformation equations, Stress invariants, Plane stress, Mohr's circle for plane stress, Octahedral stresses, Differential equations of equilibrium, Components of stresses in cylindrical polar coordinates .

Analysis of Strain

Deformable bodies, Concepts of normal strain and shear strain, Strain components at a point, Transformation equations, Principal strains, Mohr's circle for strains, Compatibility conditions, Displacement equation of equilibrium, Plane strain.

Stress-Strain relations

Uniaxial tensile test, Elasticity, Anelasticity, Work-hardening, anisotropy, homogeneity and continuity, Generalized Hooke's law, Lamé's constants, Modulus of rigidity, Bulk modulus, Relation between the elastic constants, Principle of superposition, Uniqueness theorem, Thermal effects.

Uniaxial Loading

Bars of variable cross-section, Statically indeterminate problems in tension and compression, Thin cylindrical and spherical vessels.

Torsion

Geometry of deformation of a twisted circular shaft, Stress and deformation in twisted circular solid and hollow shafts, Strain energy due to torsion, Power transmitted by circular shafts. Bending of Beams

Bending of Beams

Bending moment and shear force diagrams, Stresses due to bending, bending equation, shear stresses in symmetrical elastic beams transmitting both shear and bending moment.

Deflections due to bending

The moment curvature relation, Macaulay's and moment- area method, Castigliano's theorem.

Combined Stresses

Beam subjected to bending and shear, shaft subjected to bending and torsion, short columns.

Stability of Columns.

Stable and unstable equilibrium, Euler's formula for long columns, Rankine's formula

Springs .

Types of springs, Close coiled and open coiled springs.

List of Experiments

- Introduction to testing equipments.
- Uniaxial tension test (Mild steel, Timber)
- Uniaxial compression test (Timber-along and across, concrete, bricks, etc.) .
- Torsion test (Mild steel/aluminium).
- Bending stress distribution in beams using demec gauges and extensometer.
- Analysis of truss model with spring members.
- Compression test on brick masonry specimen.
- Hardness Test
- Creep Test
- Impact Test
- Strength of Etched and Un-etched glass
- Spring test
- To study the microstructure of various metals

Suggested Text Books & References

- Feodosyev, V., "Strength of Materials", Mir Publishers, Moscow, 1968.
- Benham, P. P & Warnock, F.V., "Mechanics, & Solids & Structures", Pitman Publishing, London, 1973.
- Seely, & Smith, J.O., "Advanced Mechanics of Materials", Tokyo, Toppan, 1952.
- Shaneloy, F.R., "Strength of Materials", McGraw Hill Book Company, 1957.
- Timoshenko, "Strength of Materials", Vol. I, McGraw Hill Book Company, 1965.
- Crandal, S. H, Dahal, N.C. & Lardener, T.J., "An Introduction to the Mechanics of Solids", Mc Graw Hill Books Co. 1985.
- Shames, I. H., "Introduction to Solid Mechanics", Prentice Hall of India Ltd, 1990.

SWITCHING AND PULSE THEORY

Switching algebra. Minimization techniques. Combinational switching circuits and applications. Synchronous and asynchronous sequential circuits and applications.

Races' Hazards and their removal. Fault modeling and detection.

Pulse response of RC circuits : HP & LP. Pulse response of a band limited circuit. Switching properties of diodes : Speed. Clipper, clamper and voltage multiplier. Bistable multivibrators : Retriggerable and non retriggerable. Astable multivibrators : Synchronization.

Suggested Text Books and References

- Kohavi, "Switching and Finite Automata Theory", 2nd ed., Tata McGraw Hill; 1978.
- Hill F. I. & Patterson, G. L., "Switching Theory and Logical Design", 3rd ed; Hohn Wiley 1981.
- Millman, I. & Taub, H., "Pulse, Digital and Switching Waveforms", McGraw Hill.
- Allen, Mottershed, "Electronic Devices and Circuits", An Introduction; Prentice Hall; 1989.

ELECTRONIC MEASUREMENTS**Indicating Instruments**

Review of fundamental and derived units - Measurement errors-Standards of measurements Deflecting and restoring torques in moving coil, moving iron and induction type meters Ammeters, Voltmeters, Wattmeters and Energy meters.

Voltage, Current and Power

Measurement of direct current and Voltage - methods of measuring alternating voltages and currents -Rectifier Instruments-Thermocouple instruments -VTVM – TVM- Amplifier. Rectifier type volt meters Power measuring techniques - Bolometer method - Calorimeter method.

RLC Measurements

DC resistance - AC wheatstone bridge - Common types of bridges: Maxwell, Hay, Wien and Schering bridges - Twin-T and Bridged- T null networks - Resistance and Q of resonant circuits - Q Meter - Impedance Measurement by substitution in Tuned circuit - Measurement of low value capacitances -Measurement of incremental inductances.

Frequency and Period Measurements

Standards of frequency - Frequency measurement by the absorption method -Comparison methods, Heterodyne frequency meter - Capacitor charge discharge method - Pulse counting method - Digital Frequency meter.

Waveform and Phase Measurements

Wave and distortion analysers for audio frequency waves -1. spectrum analysers - Wave analyser for RF signals - Phase measurements using oscilloscope - Null balance method - Phase shift to pulse conversion method - Digital phasemeter.

Amplifier Measurements

Definition of amplification and gain - Voltage gain measurement - Insertion gain -Available power gain Impedance measurements - Phase shift characteristics - Square wave testing of amplifiers – Measurements of non linear distortion - Measurement of noise figure. of amplifiers.

Suggested Text Books and References

- Sawhney, A.K., "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai & Sons, 11th edition, 1995.
- Kushnir, F., "Radio Measurements" MIR Publishers, Moscow, 1978.
- Terman, EE. and Petit, J .M., "Electronic Measurements", McGraw Hill Book Co., 1984.
- Cooper, W.D., "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 3rd Reprint 1995.

ELECTROMAGNETICS**Review**

Scalar and vector fields, vector representation of surfaces, physical interpretation of gradient, divergence and curl, Gauss's law, Stokes' theorem, Helmholtz theorem, different coordinate systems.

Electrostatics

Electric field due to point charges, use of Gauss's flux theorem, electrostatic potential, solution of Laplace's and Poisson's equations in one dimension, method of images applied to plane boundaries, Electric dipoles, polarizability, Electric flux density, boundary conditions, capacitance, electrostatic shielding, electrostatic energy.

Magnetostatics

Ampere's force law, magnetic flux density, vector potential; Ampere's circuit law, magnetic dipoles, magnetic field intensity, polarization currents; Boundary conditions, scalar potential, Faraday's laws, directional emf, inductance.

Time Varying Fields

Continuity equation, displacement current, Maxwell's equations, boundary conditions; Wave equation and its solution in different media, phasor notation; Polarization, reflection and refraction of plane waves at plane boundaries.

Suggested Text Books & References

- Plonsey, R. and Collin, R.E., "Principles And Applications of Electromagnetic Fields", McGraw Hill, 1961.
- Kraus, J.D., "Electromagnetics", Mc Graw Hill, 1973.
- Plonus, M.A., "Applied Electromagnetics", Mc Graw Hill, 1978.
- Jordan, E.C. and Balmain, K.G., "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 1976.

LINEAR IC's AND APPLICATIONS**Operational Amplifiers**

Ideal op-amp. characteristics, Inverting and non-inverting op-amp.; Difference Amplifier –Transfer characteristics; offset error voltages and currents, CMRR, PSRR, slew rate; measurement of op-amp parameters.

Analog System With Operational Amplifier As A Building Block

Basic applications - Inverter, scale changer, adder, voltage to current/current to voltage converter, voltage follower; Differential amplifier, Bridge amplifier; Instrumentation amplifier; Analog Integrator and Differentiator; Nonlinear systems - Comparator, zero crossing detector, timing mark generator, sample & hold circuits, precision diode, precision rectifier, average detector, peak detector, Logarithmic amplifier anti-log amplifier, logarithmic multiplier.

Active Filters

Introduction, Frequency response characteristics, First order LP and HP filter, second order filter model, Sallen-Key unity gain filters, Sallen-Key equal component filters, higher order filter, Band pass and Band reject filters.

Waveshaping and Waveform Generation

Oscillators-RC phase shift oscillator, Colpitts and Hartley oscillator, square wave generator, pulse generator, triangular wave generator, Schmitt Trigger, voltage controlled oscillator.

Regulated Power Supplies

Transistorized Series pass regulator; overload, short-circuit and thermal shutdown protection; Three terminal IC regulators, Basic idea of switching regulators.

Analog to Digital/Digital to Analog Conversion

Weighted resistor and Binary ladder D/A converters; Single and dual slope integration, counter, servo, successive approx. Resistor type Analog to digital converters.

Suggested Text Books & References

- Millman, and Halkias, C.C., "Integrated Electronics", Tata McGraw Hill, 1998.
- Schilling, and Belove, C., "Electronics Circuit: Discrete and Integrated", McGraw Hill, 1989.
- Soclof, "Applications of Analog Integrated Circuits", Prentice Hall of India, 1996.
- Franco, "Design with Op—amps & Analog Ics", Tata McGraw Hill, 1997.
- Jacob, "Applications & Design With Analog Ics", Prentice Hall of India, 1996.
- Tietze and Schenk,,"Advanced Electronics Circuits", Springer-Verlag, 1978.

ELECTRONIC CIRCUITS**Power Supplies**

Rectifiers- Half wave Rectifiers- Average and RMS values- Ripple factor- Regulation- Rectification Efficiency- Transformer utility factor- filters- Inductor, capacitor, L type, PI type- Ripple factor and regulatin Need for voltage regulators -Series and shunt regulators- Comparison -Current limiting and protectin, circuits- Switched mode power supplies(qualitative).

Small Signal Amplifiers

General principle of operation—classifications-RC coupled amplifiers-Gain frequency response- Input and output impedance calculations-Transformer coupled amplifier-Equivalent circuit at low medium and high frequencies- Analysis and frequency response.

DC Amplifiers

Problems in DC Amplifiers- Minimisation- Chopper Amplifiers- Differential and common mode gain -CMRR- Cascode and Darlington pair Amplifiers.

Feedback Amplifiers

Basic concept of Feed back amplifiers-Characteristics- Effect of negative feed back on gain, gain stability, distortion and bandwidth- Voltage and current feed back circuits.

Harmonic Oscillators

Barkhausen criteria-Hartley, Clapp and Colpitt's oscillators-RC, Phase shift oscillators- Wein bridge oscillators- Frequency stability of oscillators- Crystal oscillators.

Power Amplifiers

Classification-Class A/B/C- Single ended and Push-Pull configuration -Power dissipation and output power Conversion efficiencies- Complementary symmetry power amplifier.

Suggested Text Books and Reference

- Millman, and Halkias, "Integrated Electronics", McGraw Hill, Fifth Reprint, 1993.
- Boylestad, Robert L. and Louis Nashelsk, "Electronic Devices and Circuit Theory", Prentice Hall of India New Delhi, 1997.
- Schilling., and Belove., "Electronic Circuits- Discrete and Integrated" v McGraw Hill, International edition 1989.
- Mottershead, A., "Electronic Devices & Circuits: As Introduction", Prentice Hall of India, 18th Reprint, 1996.

SOLIDE STATE DEVICES

Properties of Insulators in static and alternating fields

Electronic, ionic and orientation polarization; internal field and static dielectric constant of solids; Ferro-electric and Piezoelectric materials; Effects of alternating fields on electronic and ionic polarization; A complex dielectric constant of solids; dielectric losses.

Magnetic materials

Origin of magnetic dipoles in solids; permanent magnetic dipoles; diamagnetic, paramagnetic, Ferromagnetic, Anti-Ferromagnetic and Ferrimagnetic materials.

Conductors

Concepts of relaxation time, collision time and mean free path; electron scattering, average drift velocity and conductivity; Joule heating, thermal conductivity and super conductors.

Semiconductors

Energy band diagram; covalent bonds; bound and free electrons, holes; electron and hole mobilities; intrinsic and extrinsic semiconductors; Fermi and impurity levels; impurity compensation, charge neutrality equation and semiconductor conductivity; Einstein relation; drift and diffusion currents; photo conductivity and Hall effect.

Semiconductor diode

Theory and band diagram of pn-junction; pn-junction as a diode; current components and I-V characteristics of pn-diode; effect of temperature on diode current; breakdown mechanisms; avalanche and Zener diodes; LED.

Transistors

Basic structure and principle of operation of BIT; current components and amplifying properties of BIT; Common base (CB) configuration and its input and output characteristics; current gain and active, saturation and cut-off regions of output characteristics of CB-configuration.

Common emitter (CE) configuration and its input and output characteristics; active, saturation and cut off regions of CE-output characteristics; Leakage currents; large signal current gain; dc current gain and small-signal current gain of CE-configuration.

Common collector configuration; comparison of the properties of the three configurations; thermal runaway. Basic structure and characteristics of IFET, drain conductance and transconductance of IFET, important properties of I FET.

List of Experiments

- Rectifying and breakdown characteristics of pn—junction and point contact diodes.
- Input and output characteristics of bipolar junction transistor in (a) common base and (b) common emitter configurations.
- ID-VD characteristics of junction field effect transistor
- SCR characteristics
- Measurement of h-parameters of bipolar junction transistor
- Study of basic properties of operational amplifier
- Measurement of energy band gap and resistivity of semiconductor sample.
- Measurement of carrier concentration in a semiconductor by Hall measurements.
- Measurement of junction capacitance and ideality factor of semiconductor diode.
- Effect of temperature on leakage current and breakdown voltage of pn-junction
- UJT and relaxation oscillator
- Frequency response of RC—coupled amplifier

Suggested Text Books & References

- Dekker, A.J., "Electrical Engineering Materials", PHI, New Delhi, 1998.
- Allison, A.J., "Electronic Engineering Materials And Devices", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
- Millman, J. and Halkias C.C., "Electronic Devices and Circuits", Tata McGraw Hill, 1998.
- Runyan, W.R., "Semiconductor Measurements and Instrumentation", McGraw Hill, New York, 1975.
- Millman, J. and Halkias, C.C., "Electronic Devices and Circuits", Tata McGraw Hill, 1998.

NETWORK THEORY

Three Phase Circuits

Phase voltages and currents - Phase sequence - Line and phase quantities - Phasor diagram - Balanced and unbalanced loads - Analysis of balanced load - Analysis of unbalanced load - Neutral shift method.

Power Measurements in Three Phase Circuits

Single and two Wattmeter methods - Balanced and unbalanced loads - Power factor calculation - Reactive power measurements - Power measurement in four wire systems.

Coupled Circuits A

Self inductance- Co-efficient of coupling - Dot convention analysis of coupled circuits - Ideal transformer. Analysis of single tuned and double tuned circuits involving mutual inductance.

Network Transients

Transient concepts - Transient response of simple RL, RC series and parallel circuits — Transient response of RLC series and parallel circuits - Solution of RL, RC and RLC series and parallel circuits for step input, and sinusoidal excitations using Laplace transform method.

Network Functions

Two port network parameters - Poles and zeros - Properties of network functions - Time domain behaviour from Pole - Zero plot.

Network Synthesis

Realisability concept-Hurwitz property - Positive realness-Properties of positive real functions. Synthesis of RL, RC and LC driving point impedance functions using simple canonical networks - Foster and Cauer forms.

Suggested Text Books and References

- Paranjothi, S R., "Electric Circuit Analysis", New Age International Publishers, Madras, 1996.
- Sinha, Umesh., "Network Analysis and Synthesis", Satya Prakashan, New Delhi, Reprinted Edition, 1997.
- Arumugam, M. and Premkumar, N., "Electric Circuit Theory", Khanna Publishers, New Delhi, 1987.
- Loseph, A. Edminister., "Theory and Problems of Electric Circuits", Tata McGraw Hill Publishing company, 1992.

DATA COMMUNICATION

Introduction

Model of a Digital Communication System.

Characterization of Signals and Systems

Representation of Bandpass signals and systems; Representation of Digitally Modulated Signals; Linear Memoryless modulation, Nonlinear modulation methods with memory, Baseband signals, Spectral Characteristics of the above Digitally Modulated Signals.

Modulation and Demodulation Schemes

Optimum Demodulation for completely known signals in Additive Gaussian noise; Binary antipodal signals, Binary orthogonal signals, Multiphase signals, QAM signals, M-ary orthogonal signals, M-ary Bi—orthogonal signals, Simplex signals; Probability of Error calculations for these signals.

Carriers and Symbol Synchronization Schemes

Convolutional Codes

Transfer function of a convolutional code, optimum decoding of convolutional codes -Viterbi algorithm; Probability of Error for soft decision and hard decision decoding.

Digital Communication over Linear Band-limited Channels

Characterisation of Band limited channels; Signal design for band limited channels for no ISI and controlled ISI; Optimum Demodulator for ISI and Additive Gaussian noise; Various methods of linear equalization, Decision - Feedback Equalization, Adaptive Equalization, Echo cancellation in Data transmission over telephone channels

Introduction to Spread Spectrum and Trellis Coded Modulation

Suggested Text Books References

- Proakis, J.G.,_*Digital Communication", McGraw Hill, 3rd Ed., 1996.
- Peebles, "Digital Communication",- Prentice Hall, 1987.
- Sklar, "Digital Communication", P1Pentice Hall, 1988.

MANAGEMENT SCIENCE

Principles of Management

Definition and concept of management. Evolution of management thought. Systems approach and Decision Theory approach to management. Process of decision-making.

Functions of Management Planning: types of plans, major steps in managerial planning. Strategies, MBO. Organisation; natu1Pe and purpose, P1Pocess of Organisation. Basic Departmentation. Co-ordinating; supervision, communication and direction. Leadership, Motivation.Controlling; nature and purpose, control techniques and information technology.International Management: Japanese Management Vs. U.S. Management Managerial functions in International Business.

Organisation Theory

Group Dynamics .· Defining and classifying groups, Group Processes. Group task.

Group Cohesiveness

Conflict Management.P Discovery of conflicts, Processing of grievances, conflicts resolution, conflict and intergroup relations.

Stress Management : Nature of stress. Potential Sources of Stress. Consequences strategies. A

Suggested Text Books & References

- Koontz, H. and Weihrich, H., "Essential of Management".
- Mathur, S. S., "PrinciplaEs of Management".
- Agarwal, RAD., "Organisation and Management".
- Robbin, S.P., "OrganisationalBehaviour".
- Hicks, and Gullet, "Organisations: Theory and Behaviour".
- Allen, "Management and Organisation".

ELECTRONIC INSTRUMENTATION

Measurements Basics

Errors, resolution, unit of measurement and standards.

Fundamental indicating Instruments

Galvanometer, moving coil instrument and its variations

Electronics Instruments

Electronic voltmeter, milli voltmeters and micro voltmeters, A.C. voltage measurement with rectifier, True RMS instruments, digital voltmeters, gain phase meters.

Cathode Ray Oscilloscopes

Basic block diagram, functions of blocks, dual trace oscilloscope, Analog & digital storage oscilloscope.

Transducers

Transducers for measurement of temp., pressure, liquid level & flow, linear & angular position, velocity and acceleration, digital transducer, transducer interfacing and data acquisition, computer controlled instrumentation and IEEE 488 interface.

A.C. Bridges

General equation, Maxwell's Inductance, Maxwell's inductance capacitance, Hay's Bridge. Anderson's Bridge, Measurement of capacitance using different Bridges, Measurement of inductance using different Bridges, Wein's Bridge.

Suggested Text Books & References

- Helfrick, and Cooper, W.D., " Modern Electronic Instrumentation and Measurement Techniques PHI 1992.
- Barney, "Intellegent Instrumentation", PHI 1992.
- Sahweny, A.K., "Electrical and Electronic Measurements & Instrumentation", Dhanpat Roy , & Sons.

COMPUTER ORGANISATION

Representation of information

Number systems, integer and floating point representation, character codes (ASCII, EBCDIC), Error detection-& correction codes.

Basic Building Block

Boolean Algebra, Combination logic design, flip-flops, registers, counters, ALU, Arithmetic and Logic Operations, Faster algorithms and their implementation. Organisation of Central Units (Hardwired and Microprogrammed), Microprogramming organisation. Memory types and Organisation. Address decoding and selecting.

Peripheral Devices: I/O devices (tape and disks). Programmed & Interrupt control mechanisms. I/O controllers, Bus bandwidths. Assembly Language Programming.

Programmers model of a machine. Example of a typical 16 to 32 bit processor. Registers, Addressing modes, instruction set, use of an assembly language for specific programs for typical programs like : Table Search, subroutines Symbolic and numeric manipulations, and I/O

Suggested Text Books & References

- Gear, C.W., "Computer Organisation and Programing", McGraw Hill, 1975.
- Tannenbaum, A.S., "Structured Computer Organisation", Prentice—Hall of India.
- Mano, M.M., "Computer System Architecture", Prentice-Hall of India, 1983.
- Langholz, G., Grancioni, J. and Kandel, A.L., "Elements of Computer Organisation", Prentice- Hall International, 1988.
- Assembler "Manual for the Chosen Machrne".
- Hayes, "Computer Architecture and Organisation", McGraw-Hill International Edition.
- Sloan, "Computer Hardware and Organrsatron", 2nd Edn, Galgotia Public., Pvt. Ltd.

COMMUNICATION SYSTEMS

Representation of Signals

Analogy between vectors and signals, Examples of Orthogonal Basis Functions, Fourier Series, Fourier Transform, Properties of the Fourier Transform, Fourier Transforms involving impulse functions, Spectral Density and Correlation functions of deterministic signals.

Transmission of Signals Through Systems

Linear Time Invariant systems, causality, stability, transfer function and frequency response, graphical interpretation of convolution, distortionless transmission, ideal low pass filter, Hilbert Transform, Pre-Envelope.

Random Signals

Probability, Random variables, Probability density and distribution functions, Statistical averages, Joint, moments, Transformation of random variables, Random processes, Stationarity Covariance functions, Ergodicity, Autocorrelation function and power spectral density, Transmission of a random process through a linear filter, Gaussian process.

Continuous Wave Modulation

Motivation for modulation, Amplitude modulation, Double Sideband Suppressed Carrier modulation, Vestigial Sideband modulation, Single Sideband modulation, Frequency Division multiplexing, Angle modulation: Phase & Frequency Modulation, Narrow Band Frequency Modulation, Stereophonic FM.

Pulse Modulation

Sampling Theorem, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse Position Modulation and Pulse Width Modulation; Uniform and non uniform quantization of signals, Pulse code modulation, Delta Modulation, Differential Pulse Code Modulation, Coding Speech at low bit rates.

Suggested Text Books & References

- Simon Haykin, "Communication Systems", 3rd Ed., John Wiley & Sons, 1997.
- Simon Haykin, "Communication Systems", 2nd Ed., John Wiley & Sons, 1996.
- Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 1998.
- Lathi, "Modern Digital and Analog Communication Systems", 3rd ed., Oxford University Press, Delhi, 1998.
- Bruce Carlson, "Communication Systems", McGraw Hill Kogakusha, 1986.
- Shanmugam K. Sam, "Digital and Analog Communication Systems", John Wiley & Sons, 1997.

MICROPROCESSOR THEORY

Introduction to 8-bit Microprocessor

16 bit Microprocessor

Internal architecture, pin description of any 8 bit microprocessor (Intel 8086, Z-8000 or 68000)

Instruction format, Addressing mode, Instruction set with all instructions

ALP Assembling linking, testing and running of simple programmes using Debug/MASM assembler, Typical programmes, Assembler directions.

Interrupts and related instructions.

Numeric coprocessor (e.g.8087) Need, pin descriptions, Data type, Typical system with Co-processor, Programming view with simple programmes.

Interfacing (with 8 bit/16 bit processors)

Data transfer schemes.

Memory interfacing RAM, ROM & Address decoding.

Input output interfacing 0 parallel I/O, Serial I/O, Keyboard and display interfacing, I/O mapped and memory mapped I/O, DMA concepts (using 8255, 8254, 8251, 82539, 8237, 8259 etc.), application programmes.

Microcontroller

8051/8751 architecture programming modes, internal RAM/ROM, registers, I/O ports, interrupt system, insertion set typical application.

Advanced Microprocessor

Introduction to Intel * 86 processors, Pentium I, II, III of Motorola 68 XXX processors.

Suggested Text Books and References

- Hall, D.V., "Micro processor and Interfacing" Tata McGraw Hill (2nd edition).
- Brey, "The Intel Microprocessor", Prentice Hall of India (4th edition)
- Rafiquek Kuzzman, V., "Microprocessor and Application".

AUTOMATIC CONTROL SYSTEMS**Introduction**

The control problem, open and closed loops, Illustrative examples.

Mathematical Models

Differential equation; and transfer function; Basic components and their models; Block diagram, Signal flow graph analysis; Multivariable systems and transfer function matrix.

Transient and Steady State Response

Test inputs; First, second and higher order systems, Static and dynamic error coefficients; Transient response and performed specifications.

Basic Control Actions

Proportional, Derivative and Integral control; Tachogenerator feedback.

Root Locus Technique

Introduction, general rules for construction of root loci, root locus analysis, root contours.

Frequency Response

Polar plot and Nyquist diagram, Bode diagrams, gain magnitude - phase shift plot, closed loop frequency response, frequency domain specifications.

Compensation Design

Concept. of compensation, Design of lag and lead networks both in the s-plane and in the frequency , domain.

State Space Methods

Introduction to state variable formulation and its solution.

Suggested Text Books & References .

- Ogata, K., "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 1998.
- Gopal, M., "Control Systems: Principle and Design", Tata McGraw Hill, 1997.
- Kuo, B.C., "Automatic Control Systems", Prentice Hall of India Pvt. Ltd., 1990.

INDUSTRIAL ELECTRONICS

Thyristor Characteristics, Two-Transistor Model of Thyristor, thyristor Turn-On di/dt Protection, dv/dt Protection, Thyristor Turn-On, Series Operation of Thyristors, Parallel Operation of Thyristors, Snubber Circuits' Reverse Recovery Transients.

Thyristor Commutation Techniques

Natural Commutation, Forced Commutation, Self Commutation, Impules Commutation, resonant pulse commutation, complementary commutation, External Pulse commutation, Load side commutation, line side commutation.

Controlled rectifiers

Introduction, principle of phase controlled converter operation, single-phase semiconverters, single phase full converters, single phase dual converters, single—phase series converters, three phase half wave converters three phase semiconverters, three phase full converters, three phase dual converters.

AC Voltage Controllers

Introduction, principle of on—of control, principle of phase control, single-phase bidirectional controllers A S with resistive loads, single phase controllers with Inductive loads. Three phase half wave controllers, three phase full wave controllers, three phase bi—directional delta connected controllers, single phase transformer tap changers, cycloconverters, single phase cycloconverters, three phase cyclocon converters, reduction of output harmonics.

DC Choppers

Introduction, principle of step-down operation, Step—down choppers with RL Load principle of step-up operation, performance parameters, switch-mode regulators, thyristor, chopper circuits' Impulse- commutated choppers, Effects of source and load inductance, Impulse—commutated three thyristor choppers, Resonant pulse choppers.

Inverters

Introduction, principle of operation, performance parameters, single phase bridge Inverters, three phase inverters, voltage control of three phase inverter, Harmonic Reductions.

Suggested Text Books & References

- Rasid , "Power Electronics", Prentice Hall
- Sen, P.C., "Power Electronics", Wiley eastern.
- Dubey, G.K., "Thermistor Engineering", Prentice Hall

ADVANCE SOLID STATE DEVICES**Power Semiconductor Devices**

Thyristor Construction, Operation, Characteristics, firing Circuit Design Considerations, Requirements of Firing Circuits, Two Transistor Model, Transient Characteristics, Methods of Triggering, Turn off Techniques, Turn off Characteristics.

Thyristor Types: Phase control thyristor, Asymmetrical thyristors (ASCRs), Gate turn off thyristors (GTOS), Bi-directional triode thyristors (TRIACs), Reverse conducting thyristors (RCTs), Static Induction thyristors (SITHs), Light Activated silicon controlled rectifiers (LASCR's), FET - controlled thyristors V (FET-CThs), MOS - controlled thyristors (MCTs).

Triggering Devices

Unijunction Transistor, Characteristics and applications programmable unijunction transistor (PUT), operation characteristics, relaxation oscillator using PUT applications, Diac, theory of operation, applications silicon controlled switch (SCS), operation, advantages applications. Silicon unilateral switch: (SUS) operations advantages, applications.

Silicon bilateral switch (SBS): operation, applications.

Shortly Diode, opt isolators.

Optical Electronic Devices and Fibre Optics**Photoelectric devices, photoelectric theory, kinetic energy and emitted electrons****Optical Detectors**

Photoemissive Devices: Phototube, photo multipliers, photo conductive devices, photo diode, avalanche photodiode, photo transistors, light activated SCRs photovoltage devices, light emitting diode, photoresistive devices.

Optical Fibre System: Types of optical fibre, optical sources fibre optical receivers, infra red optical links opto isolators.

Power Metal Oxide - Semiconductor field effect**Transistors (MOS FET)**

Basis structures and operation, device characteristics frequency response, switching performance safe operating area (SOA), Neutron Radiation Tolerance , High Temperature Performance.

Power MOS-Bipolar Devices

MOS gated thyristor, MOS gated structure, Insulated gate transistor, basic structure and operation, device analysis, frequency response, high voltage devices, high temperature performance, device structures and fabrication. .

Industrial Application

Electric Heating and Resistance Welding
 Battery charging Regulator
 AC Static Switches
 UPS (Standby Inverters)
 SMPS Switched Mode Power Supply
 High Frequency Fluorescent lighting.

Suggested Text Books and Reference

- Iyant Baliga, B., "Modern Power Devices", John Wiley & Sons New York.
- A Test Book on, "Power Electronics, Devices Circuits Systems & Application", by HC Rai Galgotia Publications Delhi.

ADVANCED ELECTRIC CIRCUITS**Introduction**

Standard symbols Units and abbreviations, Circuit elements, Current and Voltage sources, Ohm's and Krichoff's laws, Restive circuits, Serials and parallel _reduction, Voltage and current division, Source tranformation, Star delta transformation.

Single Phase AC Circuits

Introduction to alternating quanitites, Average and RMS values, Circuit elements, Serial and Parallel combination of circuit elements, Use of complex notation, Phasor representation of variables.

Steady state solution using phaso algebra, Analysis of series, parallel and series-parallel circuits, Active and reactive power, Power factor .

Mesh and Nodal Analysis

Loop current variables, Loop current equations, Node voltage variables, Node voltage equations, Matrix Method of solving network equations.

Network Theorems

Superposition Theorem, Thevenin's and Norton's Theorem, Maximum power transfer theorem, Millman's theorem, Compensation theorem, Reciprocity theorem, Tellegen's theorem.

Resonance in Electrical Circuits

Series and Parallel resonance, Variation of impedance with frequency, Bandwidth of RLC circuits, factor, Impedance of RLC circuit near resonance, Selectivity, Effect of variation in circuit reactive elements on selectivity.

Graph Theory

Linear Graph of a network, Tiseset and cutset schedule, Incidence matrix, Solution of resistive networks using cutset and tiseset.

Suggested Text Books and Reference

- Paranjothi, S.R., "Electric Circuit Analysis", New Age International Publishers, Madras, 1996
- Umesh, Sinha., "Network Analysis and Synthesis", Satya Prakashan, New Delhi, Reprinted edition, 1997
- Ammugam, M. and Premkumar, N., "Electric Circuit Theory", Khanna Publishers, New Delhi, 1987

COMMUNICATION HARDWARE DESIGN**Amplitude Modulation & Demodulation**

AM, DSB—SC, SSB and VSB signals; Low level AM using diodes, transistors, ICs; High level modulators: Class B and Class C, ring modulators and balanced modulators; Generation of SSB signal using frequency discrimination and phase discrimination; Envelope detectors and coherent detectors; Square Law Detectors, Costas receiver, Squaring loop.

Frequency Modulation and- Demodulation

NBFM and WBFM, Reactance modulator, Varactor modulator; Modulators using voltage controlled, oscillators and function generators; Armstrong modulator, slope detector, ratio detector, Foster-Seeley discriminator.

Receivers

Motivation and principles of super-heterodyne receivers, sensitivity, selectivity and image frequency rejection; Sub-systems of a communication receiver; Receiver evaluation and measurements.

Amplifier and Mixers

Amplifier design using admittance parameters; Broadbanding techniques; mixers using diodes, transistors, IC; Multipliers.

Phase locked loops and Frequency Synthesizers

Linear model of PLL. phase detectors, voltage controlled oscillators, loop filters, FM demodulation using PLL; PLL Applications, Digital PLL; Steady state, stability and transient analysis-of PLL, Direct frequency synthesis. PLL as a Frequency Synthesizer, Direct Digital Synthesis.

Introduction to Electronic Switching

Single stage, two stage networks; Non blocking networks, Networks with concentrators, switching centres, store program control, Distributed SPC, CPU based exchange, switching Hierarchy and Routing.

Introduction to Television

Interlaced scanning, luminance and chrominance signals, composite video signal, Television Transmitters.

Suggested Text Books & References

- Smith, lack. "Modern Communication Circuits", McGraw Hill, 1986.
- Clarke, K.K. and Hess, D.T., "Communication Circuits : Analysis & Design", Addison Wesley - Publishing Co., 1971.
- Kennedy, George, "Electronic Communication Systems", 3rd Ed., McGraw Hill, 1984.
- Gulati, R.R., "Monochrome and Colour Television", Wiley Eastern Ltd., 1986.
- Grinsec, "Electronic Switching", Elsevier Science Publishers, 1983.

MICROWAVE ENGINEERING**Microwave Tubes**

UHF limitations in conventional tubes, Analysis of a general two terminal oscillator, condition for build up and amplitude limitation; Analysis and operation of multicavity and reflex Klystron, Admittance diagram of Klystron; Analysis and operation of aTraveling Wave Magnetron, Performance charts of Magnetron tubes; Principle of operation of Traveling Wave Tube.

Microwave Semiconductor Devices

Classification of Microwave Devices, Tunnel diode, Point Contact diode, Gunn diode, two valley structures, mode of operation, circuit realization, IMPATT diode, Read Diode, circuit realisation, PIN diode, basic principle of operation, equivalent circuit, application as switch, modulator and phase shifter; Microwave Bipolar and Field Effect Transistors - characteristics and performance.

Microwave Circuits

Voltage and current definitions, uniqueness of definitions, Impedance representation of one port, two port and n port junctions; Scattering matrix and its properties, Tee's and directional coupler; Transmission matrix representations.

Microwave Lab.**Study of microwave components and instruments.**

Measurement of crystal characteristics and proof of the square law characteristics of the diode.

Measurement of Klystron characteristics.

Measurement of VSWR and standing wave ratio.

Measurement of Dielectric constants

Measurement of Directivity and coupling coefficient of a directional coupler.

Measurement of Q of a cavity.

Calibration of the attenuation constant of an attenuator.

Determination of the radiation characteristics and gain of an antenna.

Determination of the phase shift of a phase shifter.

Determination of the standing wave pattern on a transmission line and finding the length and position of the Short circuited stub.

Suggested Text Books & References

- Reich, "Microwave Principles", CBS, 1996.
- Collin, "Foundations of Microwave Engineering", 2nd ed., McGraw Hill, 1992.
- Watson, "Microwave Semiconductor Devices and Their Circuit Applications", McGraw Hill, 1969.
- Liao, Y., "Microwave Devices and Circuits", Prentice Hall of India, 1990.
- Ghose, "Microwave Circuits", McGraw Hill, 1963.

COMMUNICATION SYSTEMS - II

Baseband Pulse Transmission

Matched filter, inter-symbol Interference, Eye pattern, Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative level coding (Partial response signalling) and line coding; Adaptive Equalization, Clock recovery schemes.

Bandpass Digital Transmission

BPSK, QPSK, MSK, PDSK, FSK, OOK and QAM techniques, Carrier recovery schemes.

Performance of Continuous Wave and Digital Modulation Schemes in Noise

White noise, Narrow band noise, Noise Analysis of AM, DSB-SC and SSB using coherent detection, Noise Analysis of AM using envelope detection, Noise analysis of FM, Threshold effect in FM, Pre-emphasis and de-emphasis in FM. Quantization noise, Noise considerations in PCM, Probability of Error Analysis for the above digital modulation techniques.

Noise Sources and Characterizations

Shot noise, thermal noise, Available noise power Available power gain of a two port network, noise Figure, Noise Bandwidth, Noise Temperature, Noise Figure measurement, System noise calculations.

Information Theory

Entropy and information rate of a discrete memory less source, entropy of a Markov source, Source Coding Theorem, Huffman coding, Mutual information and channel capacity, capacity with additive white Gaussian noise.

Error Control Coding

Channel coding Theorem, Linear block codes and syndrome decoding, Cyclic codes, Introduction to Convolution codes and Viterbi algorithm.

Communication Systems Lab

IF amplifier using Transistors

I Amplitude Modulator using transistors and demodulation by envelope detection

IC based Balanced Modulator and Demodulator

Frequency Modulators using 8038 and 566

Capture range & Lock range measurement of a PLL

Frequency demodulation using PLL

IC based Sample and Hold

Pulse Width Modulator

Delta Modulator using D-Flip Flop

If Amplifier using IC 3028

Frequency Synthesizer using PLL

Suggested Text Books & References

- Simon, Haykin, "Communication Systems", 3rd Ed., John Wiley & Sons, 1997.
- Simon, Haykin, "Communication Systems", 2nd Ed., John Wiley & Sons, 1996.
- Taub and Schilling, "Principles of Communication Systems", Tata McGraw Hill, 1998.
- Lathi, "Analog and Digital Communication Systems", 2nd ed., John Wiley & Sons, 1993.
- Bruce Carlson, A., "Communication Systems", McGraw Hill Kogakusha, 1986.
- Sam Shanmugam, K., "Digital and Analog Communication Systems", John Wiley & Sons, 1997.

OPTICAL COMMUNICATION

Optical Transmission Medium

Fibre-step index, graded index, single mode, multimode; Dispersion and attenuation in fibre; Splicing Techniques, Atmosphere & Free space as medium.

Optical Sources and Amplifiers

Light Emitting Diode, Semiconductor lasers, fibre lasers, semiconductor optical amplifiers.

Optical Detectors

Si, Ge, GaAs, Detection Characteristics; Avalanche Photodiode, PIN photodiode.

Modulation and Demodulation

Internal and external modulation, Electro—optic effect, acousto-optic effect, PCM, PCM/PL, Digital PPM, PRM, PFM; Direct detection, integrated and trans-impedance amplifier; Coherent receivers - Homodyn and Heterodyne. Phase Locked Loops.

Noise Sources

Phase noise, Polarisation fluctuation noise, AM noise, Shot noise in photodiode, Thermal noise, ASE noise in optical amplifiers.

Applications

Optical WDM, CDM and TDM networks and switching, SDH/SONET, Optical ATM.

Suggested Text Books & References

- Keiser, G., "Optical Fiber Communications", 2nd Ed., McGraw Hill, 1991.
- Agrawal, G.P., "Optical Communication Systems", John Wiley, 1992.
- Yariv, A., "Optical Electronics", Saunders College Publishing, 1991.
- Gowar, I., "Optical Communication Systems", Prentice Hall of India, 1998.

DIGITAL SIGNAL PROCESSING

Introduction

Limitations of analog signal processing, Advantages of digital signal processing.

Discrete Time Characterisation of Signals & Systems

Some elementary discrete time sequences and systems; Concepts of stability, causality, linearity, time invariance and memory; Linear time invariant systems and their properties; Linear constant coefficient difference equations.

Frequency Domain Representation of Discrete Time Signal and Systems

Complex exponentials as eigen functions of LTI systems; Fourier Transform of sequences, Fourier Transform theorems and symmetry properties of Fourier Transform.

Sampling of Continuous Time Signals

Frequency Domain Representation of Uniform/sampling Reconstruction of a continuous time signal from its sample; Discrete Time Processing of Continuous time signals and vice-versa; Decimation Interpolation; Changing the sampling rate by integer and non integer factors using discrete time processing.

The Z Transform

Limitations of the Fourier Transform; Z-Transform, Region of convergence Properties of the Z-transform; Inverse transform using contour integration; Complex convolution theorem; Parseval's relation; Unilateral Z-transform and its application to difference equations with non zero initial conditions.

Discrete Fourier Transform

DFT and its properties; Linear, Periodic and Circular convolution; Linear Filtering Methods based on DFT; Filtering of long data sequences; Fast Fourier Transform algorithm using decimation in time and decimation in frequency techniques; Linear filtering approaches to computation of DFT.

Transform Analysis of LTI systems

Frequency response of LTI systems, System functions for systems characterised by linear constant coefficient difference equations, Relationship between magnitude and phase; All pass systems, Minimum phase systems.

Structure for Discrete Time Systems

Signal flow graph representation, Transposed forms, Lattice structures

Design of Digital Filters

Linear Phase FIR filters; FIR differentiators and Hilbert Transformers; IIR filter design by Impulse Invariance, Bilinear Transformation; Matched Z-Transformation, Frequency Transformations in the Analog and Digital Domain.

Finite Precision Effects

Fixed point and Floating point representations, Effects of coefficient quantization, Effect of Roundoff noise in digital filters, Limit cycles.

Digital Signal Processors

Architecture and various features; of TMS/ADSP_ series of digital signal processors; instruction set and few applications of TMS 320 CXX.

Suggested Text Books & References

- Oppenheim, A.V & Schafer, R.W., "Discrete Time Signal Processing", Prentice Hall, 1989.
- Proakis, J.G. & Manolakis, D.G., "Digital Signal Processing", Prentice Hall, 1992.
- Oppenheim, AM, Willsky A.S. & Young; I.T., "Signal &-Systems", Prentice Hall, 1983.

MICRO ELECTRONIC `DEVICES AND VLSI TECHNOLOGY

Basic Device Technology

Single crystal growth and purification, epitaxy; oxidation, diffusion, ion implantation and pn junction formation; semiconductor measurements.

Integrated Circuit Fabrication Process

Monolithic, hybrid, thin film and thick 'film technology; pattern generation and photo mask fabrication, photolithography, isolation technique, metalization, interconnection; encapsulation and testing.

Monolithic Circuit Components

Epitaxial diffused system, diffused collector process, triple diffused process, bipolar transistor formation; diode formation, basic diode connections of IC transistors, diode as capacitor, thin film capacitor; sheet resistance, diffused resistor, thin film resistor, parasitics in integrated circuits, layout considerations.

MOS Technology

MOSFET as basic IC component, comparison of MOSFET with BIT as IC component, MOS isolation techniques, poly-silicon gate technology, self aligned gate technology; NMOS process sequence, NMOS inverter, pass transistor-and gates; N-tub, P-tub and twin-tub CMOS structures; CMOS-process sequence.

VLSI Technology

Scaling theory and device miniaturization, E beam masks, plasma etching, choice of photo resists; stick diagrams, VLSI design rules and layout diagrams, computer aids.

VLSI Circuit Concepts

Inverter delays, driving large capacitive loads, propagation delays and effect of wiring capacitances; pull up and pull down ratios of NMOS and CMOS inverter, alternative forms of pull up, NMOS and CMOS inverter transfer characteristics, CMOS gates.

Suggested Text Books & References

- Warner, I r. (Ed.), "Integrated Circuits-Design Principles And Fabrication", McGraw Hill Book Company, New York, 1965.
- Veronis, A., "Integrated Circuits Fabrication Technology", Reston Publishing Company Inc.I Virginia, 1979.

- Allison, "Electronic Integrated Circuits—Their Technology And Design", McGraw Hill Book Company, 1975.
- Sze (Ed.), "VLSI Technology", McGraw Hill Book Company, USA, 1983.
- Mead and Conway, L.A., "Introduction to VLSI Systems", Addison Wesley, USA, 1980.

DIGITAL HARDWARE DESIGN

IEEE Logic symbol: Mixed logic representation: review of POS and SOP minimization: multi output function: variable entered mapping: CAD tools for minimizing functions of more than six variables: ED-CR canonic forms and minimization.

Iterative arrays- time and space iteration: examples of arithmetic and code conversion circuits: Wired logic: practical consideration—fan in, fan-out and delay: partitioning functions.

Sequential Machines: Mealy and Moore machines: Counter design examples: State reduction and next state decoders: Multimode counters: Shift register sequencers: timing and triggering: Clock skew.

System controllers: functional partition and flow diagram development: State specification: State assignment and next state decoder: output decoders: use of MSI decoders, multiplexer ROMs and PLAs in system controllers: Programmable controllers-use of shift registers and counters: Controllers with fixed and variable instruction sets: Control sequencers: RTL description of simple machines: design from RTL descriptions.

Interfacing with microprocessors: Using custom PLAs and ROMs for interfacing: Displays: Floppy disk storage

Asynchronous and synchronous serial data Communication

Asynchronous machines—analysis and design: races and hazards.

Suggested Text Books and References

- Fletcher, W.I., "An Engineering Approach to Digital Design", Prentice Hall of India (1990).
- Hall D.V., "Microprocessors & Interfacing", Tata McGraw Hill 1986.
- Hill, F J. & Peterson, G.R., "Digital Logic & Microprocessors", Wiley 1984.

SATELLITE COMMUNICATION

Introduction

Origin and brief history of satellite communication; Elements of a satellite communication link; Current status of satellite communication.

Orbital Mechanism And Launching Of Satellite

Equation of orbit, describing the orbit, locating the satellite in the orbit, locating the satellite with respect to earth, orbital elements, look angle determination, Elevation and Azimuth calculation, Geostationary and other orbits, orbital perturbations, orbit determination, Mechanics of launching a synchronous satellite, selecting launch vehicle.

Space Craft

Satellite subsystems, Altitude and Orbit Control System (AOCS), Telemetry, Tracking and Command (TT&C), Communication subsystems, Transponders, Spacecraft antennas, Frequency re-use antennas.

Satellite Channel And Link Design

A Basic transmission theory, noise temperature, calculation of system noise temperature, noise figure, G/T ratio of earth stations, design of down links and uplinks using C/N ratio, FM improvement factor for multichannel signals, Link Design for FDM/FM, TV signals and Digital Signals.

Multiple Access Techniques

Frequency Division Multiple Access (FDMA), FDM/FM/FDMA, Time Division Multiple Access, Frame structure and synchronization, Code Division Multiple Access, Random Access.

Earth Station Technology

Earth station design, basic antenna theory, antenna noise temperature; Tracking; Design of small earth station antennas, low noise amplifiers, High power amplifiers, FDM and TDM systems.

Operational Satellites

INTELSAT, INMARSAT and INSAT systems, Applications of INSAT, Satellite Television Receivers, Direct Broadcast Satellites, Direct Reception System for television and other applications.

Suggested Text Books & References

- Pratt, T. & Bostian, C.W., "Satellite Telecommunication", John Wiley & Sons, 1986.
- Roddy, D., "Satellite Communication", Prentice Hall, 1989.
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**LIST OF SUGGESTED OPEN ELECTIVES
&
PROFESSIONAL ELECTIVES**

Open Elective

1. Enterprise Resource Management
2. E-Commerce, Strategic IT
3. Technology Management
4. Decision Support and Executive information system
5. Software Technology
6. Knowledge Management
7. IT in Marketing Management
8. IT in HR Management
9. IT in Finance Management
10. Project Management and Software Tools
11. Human Values
12. Science Technology and Society

Professional Electives

1. Active Filters
2. Speech Signal Processing
3. Digital Image Processing
4. Satellite Communication Systems
5. Optical Communication
6. Computer Network
7. Data Communication and Design
8. Microprocessor Based System Design
9. Advanced Topics in Microprocessors & Microcontrollers
10. Personal Computer Systems
11. Biomedical Instrumentation
12. Power Electronics
13. System Software
14. Computer Graphic
15. Modelling and Simulation
16. Television Engineering
17. VLSI Design
18. Natural Networks and Fuzzy System
19. Computer Networks

Note: The Institutions can frame syllabi of professional electives and open electives to be offered by them in the particular area

Open Electives**HUMAN VALUES**

The objective of the course is an exploration of human values which go into making a 'good' human being, a 'good' human society and a 'good' life. The context is the work life and the personal life of modern Indian professionals.

1. The value—analysis in the contemporary Indian Society.
2. The nature of values: the value spectrum for a 'good' life
3. The Indian system of values.
4. Material development and its values: the challenge of science and technology .
5. Psychological values: integrated personality; mental health
6. Societal values: the modern search for a 'good' society; justice, democracy, rule of law; values in the Indian constitution.
7. Aesthetic values: perception and enjoyment of beauty
8. Moral and ethical values; nature of moral judgments; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.
9. Work ethics; professional ethics.
10. Spiritual values; different concepts; secular spirituality.
11. Relative and absolute values.
12. Human values: humanism and human values; human rights; human values as freedom, creativity, love and wisdom.
13. Management by values: professional excellence; inter-personal relationships at work place; leadership and team building; conflict resolution and stress management; management of power.

SCIENCE TECHNOLOGY AND SOCIETY

It will be innovative course dealing with social, human and ethical implications of engineering and technology, with special reference to the Indian situation. Its three main components are:

- (i) Social and Cultural history of technology,
- (ii) Social and Human critiques of technology,
- (iii) Engineering Ethics and Professional Ethics.

The proposed course- structure is as follow:

1. Science, Technology and Engineering, as knowledge and as social and professional activities.
2. Inter-relationship of technology growth and social, economic and cultural growth; historical perspective.
3. Ancient, medieval and modern technology/Industrial revolution and its impact. The Indian Science and Technology.
4. Social and human critiques of technology? Mumford and Ellul.
5. Rapid technological growth and depletion of resources. Reports of the club of Rome. Limits to growth; sustainable development.
6. Energy crisis; renewable energy resources.
7. Environmental degradation and pollution. Eco-friendly technologies. Environmental regulations. Environmental ethics.
8. Technology and the arms race. The nuclear threat.
9. Appropriate technology movement Schumacher; later developments.
10. Technology and the developing nations. Problems of technology transfer. Technology assessment impact analysis.
11. Human operator in engineering projects and industries Problems of man machine interaction. Impact of assembly line and automation. Human centred technology.
12. Industrial hazards and safety. Safety regulations. Safety engineering.
13. Politics and technology. Authoritarian versus democratic control of technology. Social and 'ethical audit of industrial organisations.
14. Engineering profession. Ethical issues in engineering- practice. Conflicts between business demands and professional ideals. Social and Ethical responsibilities of the engineer. Codes of professional ethics. Whistle blowing and beyond. Case studies.