**First Year First Semester**

**Hum/T/A HUMANITIES-A**

English - 2 Pds/week - 50 Marks  
Sociology - 2 Pds/week - 50 Marks

**HUMANITIES**

1. Basic writing skills  
2. Report, Covering Letter & Curriculum-Vitae writing  
3. Reading and Comprehension  
4. Selected Short Stories

Text Book: ENGLISH FOR ALL

**SOCILOGY**

1. Sociology: Nature and scope of Sociology - Sociology and other Social Sciences - Sociological Perspectives and explanation of Social issues  
2. Society and Technology: Impact of Technology on the Society - A case study  
3. Social Stratification: Systems of Social Stratification - determinants of Social Stratification - Functionalist, Conflict and Elitist perspectives on Social Stratification  
5. Development - Conceptions of and approaches to development - The Roles of State and the Market in the Development  
7. Industrial Policy and Technological change in India - The nature and Role of the State in India  
8. Technology Transfer: The Concept and Types of Technology Transfer-Dynamics of Technology Transfer  
9. Technology Assessment: The Concept - Steps involved in Technology Assessment  
10. Environment: Sociological Perspectives on Environment - Environmental Tradition and values in ancient India  
12. Technological Problems and the Modern Society: Selected Case Studies - Electric Power Crisis, Industrial and/or Environmental Disaster, or Nuclear Accident

**ET/T/112 ELECTRON DEVICE- I**


C- LANGUAGE AND DATA STRUCTURES Introduction to computer, solving problems on a computer- flowchart, algorithm, steps to run a program on computer. Features of C- language: character set, data types, operators and expressions, data input and output, control statements, functions, arrays, pointers, structures and unions, data files; Built-in data structures - one-dimensional arrays, two-dimensional arrays, records; Introduction to Stacks, Queues and Linked lists; Sorting and searching algorithms, elementary notion of analysis of algorithms.

ET/Math/T/113 MATHEMATICS – IG

Successive differentiation. Leibnitz theorem, Rolle’s theorem (statement only), Mean value theorems, Taylor’s and Maclaurin’s theorem in finite and infinite form, Indeterminate forms; Functions of two independent variables: their limits and continuities, Partial derivatives, Euler’s theorem: Partial derivatives of composite and implicit functions. Jacobians, Taylor’s theorem (statement only). Maxima and minima, Lagrange’s method.

ET/Math/T/114 MATHEMATICS – IIG

Vector Algebra: Addition of vectors, Multiplication of vector by a scalar, Scalar and vector product of two vectors. Scalar and vector triple product, Applications to mechanics, Vector Calculus: Differentiation of a vector function; Directional derivatives – gradient, divergence and curl; Relations involving them. Theorems of Green, Gauss and Stoke.

Complex Analysis: Complex numbers. D’Moivre’s Theorem; Exponential values of sine and cosine; Functions of a complex variable; Limit continuity and differentiability, Cauchy – Riemann conditions, Complex integration, Cauchy’s fundamental theorem, Cauchy’s integral formula; Taylor’s theorem, Laurent’s theorem, Poles and residues, Contour integration, Conformal mapping, Schwarz-Christoffel Transformation.

Ph/T/1B PHYSICS-IB
1. Use of vectors in particle mechanics, Unit vectors in spherical and cylindrical polar coordinates, Conservative vector fields and their potential functions - gravitational and electrostatic examples, Gradient of a scalar field, Equipotentials, States of equilibrium, Work and Energy, Conservation of energy, Motion in a central field and conservation of angular momentum.
2. Angular momentum of a system of particles, Torque, Moment of inertia, Parallel and Perpendicular axes theorem, Calculation of moment of inertia for (i) thin rod, (ii) disc, (iii) cylinder and (iv) sphere. Rotational dynamics of rigid body (simple cases).
3. Motion of fluids, Bernoulli's equation and its applications, motion of viscous fluids - Poiseuille's equation.
4. Simple harmonic motion, Composition of simple harmonic motion, Forced vibration and resonance, Wave equation in one dimension and travelling wave solution, Standing waves, Wave velocity and group velocity.
5. Assumption for the kinetic theory of gases, Expression for pressure, Significance of temperature, Deduction of gas laws, Qualitative idea of (i) Maxwell's velocity distribution. (ii) degrees of freedom and equipartition of energy, Specific heat of gases at constant volume and constant pressure.
6. Macroscopic and microscopic description, Thermal equilibrium, Zeroth law of thermodynamics, Concept of international practical temperature scale, Heat and Work, First law of thermodynamics and some applications, Reversible and irreversible processes, Carnot cycle, Second law of thermodynamics, Concept of entropy, Thermodynamic relations.
7. Statistical description of a system of particles, Phase space, Microstates and macrostates, Boltzmann's formula for the entropy, Canonical partition function, Free energy and other thermodynamic quantities in terms of the partition function, Classical ideal gas, Equipartition theorem and its applications.

**ET/T/116 C LANGUAGE & DATA STRUCTURES**

Introduction to computer, solving problems on a computer- flowchart, algorithm, steps to run a program on computer.
Features of C- language: character set, data types, operators and expressions, data input and output, control statements, functions, arrays, pointers, structures and unions, data files;
Built-in data structures - one-dimensional arrays, two-dimensional arrays, records;
Introduction to Stacks, Queues and Linked lists;
Sorting and searching algorithms, elementary notion of analysis of algorithms.

**Ph/S/1 PHYSICS LABORATORY**
(Selected Experiments from the following)

1. Determination of Galvanometer resistance by half - deflection method.
3. To find high resistance by Galvanometer deflection method.
4. To measure mechanical equivalent of heat, J by electrical method (Joule's) using
copper calorimeter (radiation correction to be done).
5. To compare to low resistance by drop of potential method.
6. To determine resistance per unit length of wire by using Carey Foster bridge.
7. To estimate strength of a current by using copper voltmeter.
8. a) To compare the EMF's of two cells by using a potentiometer
   b) To measure current by using a potentiometer
9. To measure the horizontal components of earth's magnetic field intensity using deflection and vibrating magnetometers.
10. Determination of co efficient of linear expansion by optical lever method.
12. To determine co-efficient of viscosity by Capillary flow method.
14. To draw mutual and anode characteristics of triode and hence too fine Rp, µ, and gm
15. To draw the transistor characteristics (NPN/PNP) in the given configuration and hence to find hi, hf
16. Determination of refractive index of the material of the glass prism by prism spectrometer (for at least two ?s)
17. Study of collisions in one dimension using a linear air track
18. Use of an air track for obtaining potential energy curves for magnetic interactions.
19. Study of oscillations under potential wells of various shapes using an air track.
20. Experiments on diffraction in single slit, double slit and plane grating using He- Ne laser
   a) To find the wavelength of a monochromatic light by single slit.
   b) To find slit separation of a double slit.
   c) To find number of rulings per cm of a plane grating
21. To find the wavelength of a monochromatic light by Newton rings.
22. Fabry-Perot interferometry: To find out separation of wavelength of sodium D1 & D2 lines.

**BED/ME/S/1 BASIC ENGINEERING DRAWING**

Drawing primitives: instruments, letters, lines, title block, geometric curves & shapes, scale and dimension.
Projection: orthographic and isometric, sectional views.

**ET/S/113 PROGRAMMING LABORATORY**

Programs related to "C Language & Data Structures".

**WS/ME/S/6A WORKSHOP PRACTICE-VI (Carpentry and Fitter Shop)**

Introduction to types of Indian woods used for engineering purposes and carpenter’s tools; use of wood working machines; making of selected joinery.
Introduction to fitter’s tools, gauges, measuring instruments etc.; marking of jobs; fitter’s job involving chipping, filing, sawing, drilling; use of taps and dies; pipe fittings and plumbing.
First Year Second Semester

**ET/T/121 CIRCUIT THEORY**


**ET/T/122 ELECTRON DEVICE- II**

Metal-semiconductors Junction: Band diagram, depletion region & capacitance, ohmic & rectifying contacts, Schottky diodes. Semiconductor-Semiconductor Junction: Basic device technologies for fabrication of a p-n jn., homojunction & heterojunctions; equilibrium band diagram, charge, field & potential profiles in p-n junctions., depletion region, depletion capacitance, biased p-n junctions., diode eq. & diode characteristics, diffusion capacitance, circuit models of p-n junction diode. Breakdown mechanisms in p-n junctions.: Avalanche & Zener processes & their dependence upon temperature & doping. Degenerate p-n junctions.: Band model under large doping condition, Tunnel diode, I-V characteristics, equivalent circuit, applications, Backward diode. Metal-Insulator-Semiconductor junction: Band diagram. Bipolar Transistors: Band diagram, the transistor action, current components in a BJT, current amplification factors, Early effect & its consequences, different modes of operation, input & output characteristics, load line & amplifier operation, Ebers-Moll eqs., large signal model, dependence of current gain factors on temperature, frequency and physical & electrical parameters, low frequency equivalent circuits, gain & noise parameters calculations, high frequency equivalent circuit. Junction field effect transistor (JEET): Principle of operation, JFET parameters, eqv. Circuit, JEET biasing, self bias, design of bias circuits, load line, amplifier characteristics. Insulated gate field effect transistor (IGFET) : constructoin & principle of operation of p- & n-channel enhancement & depletion mode MOSFETs, drain & transfer characteristics, threshold voltage & its control, PSG & SOI systems, CMOS inverter, speed of operation, V-MOS construction, operation & characteristics, CCD: construction & principle of operation. Power Semiconductor Devices: Semiconductor Controlled Rectifier, construction & operation, forward & reverse characteristics, triggering methods, SCR specifications, SCR control, Shockley diodes, diac, triac: operation & characteristics; Unijunction Transistors (UJT), UJT control of SCR, Programmable UJT; V-MOS construction, operation & characteristics; IGBT characteristics. Switching characteristics of devices: Switching phenomenon in diodes, BJT, MOS & CMOS,
switching times, switching speeds, speed up capacitor. Basic optoelectronic devices: Light emitting diode, Liquid crystal display, Solar cell, Photodiode, phototransistor, Seven segment display.

**ET/Math/T/123 MATHEMATICS – IIIG**

Abstract Algebra : Sets and set operations: D’Morgan’s Laws, Cartesian product of sets; Binary relations: equivalence relations, partial ordering relation, Lattice, Boolean algebra, Semigroups, Groups; Subgroups, Cyclic groups, Normal subgroups; Quotient groups, Homomorphism and isomorphism theorems. Rings, Polynomial rings, fields, subfields. Linear Space, Linear dependence and independence. Basis, Dimension; Normal Linear space, Inner product space.

**ET/Math/T/124 MATHEMATICS – IVG**

Linear transformations and matrices: Conformability of matrix sum and product; Types of matrices. Determinants and their properties. Rank of a matrix, Condition for the existence of solutions of a system of linear equations and their uniqueness, Characteristic equation of a matrix, Cayley Hamilton Theorem; Eigenvector and eigenvalue of a matrix (linear transformation).

Sequence and infinite series of positive terms: Their convergence or divergence; Comparison test; D’Alembert’s ratio test and Cauchy’s root test.

Exact equation of first order , 1st order linear equation Solution of ordinary second order linear differential equation of with constant coefficients, Ordinary point and regular singular point of equations with variable coefficients. Method of Frobenius, Bessel and Legendre functions. Solution of system of ordinary linear differential equations, Method of phase plane, Critical point and stability.

**AM/ME/T/1B ENGINEERING MECHANICS**

Statics:
Dynamics:
Intro to vector calculus, Definition of vectors in Dynamics, Rectilinear Motion, Curvilinear motion of particle and description of different coordinate systems, Kinetics, Newton's Law and D’Alembert's principle and application to rectilinear and curvilinear motion, constrained motion, Energy and Momentum methods.

**Ph/T/2B PHYSICS-IIB**

1. Biot-Savart law and Ampere's law in magnetostatics, Calculation of magnetic field in simple situations like (i) straight wire (ii) circular wire (at a point on the symmetry axis) and (iii) Solenoid.
2. Time-varying fields, Faraday's law of electromagnetic induction, Self and mutual
inductance, Resonance and oscillation in electrical circuits.


4. Energy levels of the hydrogen atom and the Bohr atom model, X-ray spectra, X-ray diffraction, Bragg's law, Compton effect. De-Broglie waves, Particle diffraction, Uncertainty principle and its application

5. Wave-particle duality and uncertainty principle, Two-slit experiment, Concept of wave function, physical interpretation of wave function, Probability density, current, equation of continuity, Time independent Schrodinger equation for a free particle and a particle in a potential, Stationary states, Postulates of quantum mechanics, expectation values of physical observables, energy eigenvalues for particle in a box, Square well potential, Reflection and transmission coefficient in potential barriers, Linear harmonic oscillator, Particle in a central potential, Orbital angular momentum, Hydrogen atom- energy levels, degeneracy.

**ET/S/121**  NUMERICAL ANALYSIS LABORATORY

**ET/S/122**  CIRCUIT THEORY LABORATORY-I

Experiments related to "Circuit Theory".

**ET/S/123**  ELECTRON DEVICES LABORATORY

Experiments related to "Electron Device-I and Electron Device-II".

**WS/ME/S/12B**  WORKSHOP PRACTICE-XII (Machine Shop)

Introduction to machine tools - lathes, drilling machines, shaping machines, planning machines, slotting machines, milling machines, grinding machines; machine shop work involving different operations by using the above mentioned machines through making of jobs.

Experiments on: Study of the speed structure of a lathe, study of apron mechanism and calibration of feeds in a lathe.

Study and grinding of various cutting tools.

Second Year First Semester

**ET/T/211**  ELECTROMAGNETIC THEORY

Fundamentals of Vector Algebra, Vector Calculus, Physical Interpretation of Differential Vector operations, Green's Theorem, Divergence & Stoke's Theorem, concept of scalar &

**ET/T/212 NETWORK SYNTHESIS**


**ET/T/213 SIGNAL THEORY & NOISE**


Suggested Text Books:


**ET/T/214  DIGITAL LOGIC CIRCUITS**

Number Systems: Decimal, Binary, Octal and Hexadecimal systems, conversion from one base to another. Codes: BCD, Excess-3, Gray Reflected ASCII, EBCDIC. Algebra for logic circuits: Logic variables; Logic constants; Logic functions- NOT, AND, OR, NAND, NOR, Ex-OR; Boolean Algebra (including Shanon's expansion theorem and consensus theorem); Canonical representations-minterm, maxterm; Karnaugh map simplification, Quin Maclousky minimization. Families of logic circuits: Transistor inverter, RTL, Diode logic, DTL, TTL, Brief introduction to DCTL, IIL, HTL, ECL and MOS gates. Combinational circuits: Analysis and synthesis of combinational circuits, Multiplexer, Demultiplexer, Encoder, Decoder, Code-converter, Adder, Subtractor, Comparator, Parity generator/checker, Priority encoder. Sequential Circuits: Flip-flops-SR, JK, D and T; Registers- Buffer registers, shift registers etc.; Counters- Asynchronous and synchronous counters; Interface circuits: Digital to Analog converter (DAC) - weighted resistor method, R-2R ladder method; Analog to Digital converter (ADC) - parallel comparator method, counter method, successive approximation method, dual-slope method.

**ET/T/215  ANALOG CIRCUITS-I**

1. DIODE CIRCUITS Ideal and piecewise linear models of diode, graphical analysis; Analysis and design of circuits-transient switching characteristics of diodes; Clippers, clamps, rectifiers, zener regulators; Power supplies, surge studies, I²-t curve; Power supply filters. 2. BJT AMPLIFIERS Analysis and design of different biasing circuits (including stability) for BJT amplifiers, BJT biasing for integrated ckt, h-parameter model of BJT, mid frequency and low frequency analysis of CE, CB and CC amplifier, Hybrid-pi model of BJT, high-frequency analysis of BJT amplifiers, transistor as a switch; transient switching characteristics of transistors. Numerical solution for large signal amplifiers-covergence problem. 3. FET AMPLIFIERS Analysis and design of different biasing circuits for FET amplifiers, small-signal low frequency model of FET, mid-frequency and low-frequency analysis of CS, CG and CD amplifiers, small-signal high frequency model of BJT, high frequency analysis of FET amplifiers, Bode plots. 4. FEEDBACK AMPLIFIERS General theory of feedback, Barkhausen criteria, stability of feedback amplifier, different feedback topologies, effect of different parameters of an amplifier, frequency response of 2 pole/3 pole feedback amplifiers, Bode plot, gain and phase margin, compensation, method of analysis, Design examples. 5. OPERATIONAL AMPLIFIERS Differential amplifiers using BJT and FET, Characteristics of op-amp, ideal and non ideal properties, High frequency effects on op-amp gain and phase, Bode's plot. Slew rate limitation, Linear and nonlinear circuits operations of op-amps like adder, substractor, multiplier circuits, spice analysis of op-amp circuit, integrator differentiator,
all active filters, comparators, Schmitt trigger (inv and non-inv), triggerable and non-
triggerable multivibrator, triangular and sinusoidal wave generator, precision rectifier,
peak detector, wein bridge oscillator, phase shift oscillator, quadrature oscillator.

ET/EE/T/216   ELECTRICAL MACHINES

PART I
Single-Phase Transformer
Construction and basic principle of operation, Core type and shell type. Materials used
for core. Winding and insulation, (E.M.F. equivalent circuit;) Equivalent circuit referred
to primary -- phasor diagram, Polarity test, O.C and S.C. test Regulation. Efficiency. All
,day efficiency, Parallel operation.

Induction Motor
Three phase balanced excitation system. Development of rotating magnetic field.
Frequency of the induced emf and relationship to number of poles. Construction and
basic principle of operation of 3 phase induction motor, Slip, Slip speed and slip
frequency, Per-phase equivalent circuit, Phasor diagram, Types of windings, Squirrel
cage and slip-ring motor construction, Equations for torque, Torque-speed characteristics,
Effect of change in rotor resistance in slip-ring machine, Methods of starting and speed
control.

PART II
D.C. Machines
Construction and operating principle, Function of commutator and brush system,
Armature reaction and their effects, MMF distribution, Commutation, Interlopes.

D.C. Generators
EMF equation characteristics with different excitation systems, Voltage relation. Parallel
operation.

D.C. Generators
Equation for torque, characteristics with different excitation systems. Method of starting.
Speed control, Speed-torque characteristics.

Synchronous Machines
Alternator: Construction, EMF equation, Armature reaction with different power factor of
loads, Phasor diagram, Methods of determination of voltage regulation. Parallel operation
of alternators and synchronization.

Synchronous Motors
Principle of operation, Hunting, Starting method.

ET/S/211   ANALOG CIRCUIT LABORATORY-I

Experiments related to " Analog Circuits-I".

ET/S/212   DIGITAL CIRCUIT LABORATORY-I

Experiments related to " Digital Logic Circuits".

ET/S/213   CIRCUIT DESIGN LABORATORY
Specific design problems would be assigned by the teacher concerned.

**ET/EE/S/214 ELECTRICAL MACHINES LABORATORY**

1. EMF Induced In DC Machine
2. External Characteristics of DC shunt/compound Motor- study relations between speed, field current and armature voltage.
5. OC and SC of a single phase transformer and determination of loss, efficiency and regulation.

**Second Year Second Semester**

**ET/T/221 MATERIAL SCIENCE**


**ET/T/222 DIGITAL CIRCUITS & SYSTEMS**

Analysis and synthesis of sequential circuits: Basic models of sequential M/C, Analysis of asynchronous and synchronous circuits, Synthesis of completely and incompletely specified synchronous sequential M/Cs. Fault detection and location in combinational circuits: Fault detection and location, classical methods, path sensitizing method,
Equivalent-Normal-Form method, Two level-circuit fault detection, Multi-level-circuit fault detection, Boolean difference method, SPOOF method. Digital system design: Hardware programming language (HPL), Application of HPL in designing data unit and control unit of a digital system. Timing circuits: Timing circuits using gates, Schmitt trigger, 555 timer, 74121 mono shot, retriggerable mono shot- 74122, 74123. Arithmetic circuits: Fixed-point and floating-point representation of data, serial and parallel Addition(CLA), substraction, multiplication and division algorithms (add & shift & Booths' algorithm) and their circuit implementation and division) for fixed-point signed magnitude data, fixed-point binary data in signed 2's complement representation, floating-point binary data and binary coded decimal (BCD) data. Semiconductor Memory: Read Only Memory (ROM)- PROM, EPROM, EEPROM, Random Access Memory (RAM)-static, dynamic, Memory characteristics, Memory organization and applications. Digital system design using FPGA & CPLD.

ET/T/223 ANALOG COMMUNICATION SYSTEMS

INTRODUCTION Introduction to basic elements of communication systems SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS Condition for distortionless transmission of signals through networks. Different types of distortion and their effect on the quality of output signals. Transmission of transient signals, distortion analysis. AMPLITUDE MODULATION Modulation principle and definitions, spectrum and power considerations, DSB,SSB, VSB and AM principles. Different type of modulator circuits, Transistorised modulation circuit, Square law modulator, collector modulator etc. Balanced modulator. Different circuits for generation of SSB and VSB. DEMODULATOR Basic principle of coherent detections, Square law detectors, Average envelope and peak envelope detectors. Distortions Detector circuit design. Design problems. FREQUENCY AND PHASE MODULATION Principles and definitions, Relationship between frequency and phase modulations. Phase and frequency deviations, Spectrum of FM signal, bandwidth considerations. Effect of modulation index on bandwidth, Narrow band and sideband FM and PM principles, Circuit for realization of FM and PM. Steriophonic FM Principle. DEMODULATION Principle of demodulation: Different type of demodulator, discriminator, use of PLL etc. RADIO TRANSMITTER Basic block diagram of radio transmitter (AM and FM), Analysis of a practical circuit diagram used for medium power transmitter. RADIO RECEIVER Basic block diagram of TRF, Superheterodyne principle, its advantages. Mixer principle and circuit, AVC, Radio receiver measurement. SYSTEM NOISE CALCULATION Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection, Threshold effect. Signal to noise calculation for FM and thereshold.

ET/T/224 TRANSMISSION LINES AND WAVEGUIDES

Circuit representation of transmission lines, Transients in a transmission line, Sinusoidal excitation of transmission lines, Distinction between distributed and lumped constant systems, Discussions on line parameters, Characteristic impedance. Complex propagation constant, Distortions in transmission lines. Terminated transmission line. The impedance transformation, Smith chart. Impedance matching and two-port network analysis. Theory

**ET/EE/T/225 ELECTRICAL MEASUREMENTS**

Electrical measuring instruments - their classifications, Damping and balancing. Principles of moving coil, moving iron and dynamometer type of ammeters and voltmeters, Shunt multipliers for dc and ac instrument, measurements of low medium and high resistance. AC and DC potentiometers, Conventional moving -coil instruments. Ballistic and vibration galvanometers, Principles of thermal and induction type of indicating instruments, Frequency meters, Dynamometer wattmeter, power factor meter. AC energy meters Instrument transformers, General theory of ac bridge circuits and simple AC bridge. Magnetic measurements, principles of high voltage measurements.

**ET/S/221 MATERIAL SCIENCE LABORATORY**

Experiments related to "Material Science".

**ET/S/222 DIGITAL CIRCUITS LABORATORY-II**

Experiments related to "Digital Circuits and Systems".

**ET/S/223 ANALOG COMMUNICATION LABORATORY**

Experiments related to "Analog Communication Systems".

**ET/EE/S/224 ELECTRICAL MEASUREMENTS LABORATORY**

1. Measurement of low resistance by Kelvin Double Bridge.
2. Measurement of high resistance .
4. Measurement of Inductance by Owen's Bridge.
5. Measurement of capacitance by Schering Bridge.
7. Test of P.T. by absolute technique.

**Third Year First Semester**

**ET/T/311 MICRO PROCESSORS AND MICROCONTROLLERS**
Concept of pipelining and parallel processing, Uniprocessor and multiprocessor environment, Evolution of microprocessors: 8085, 8086, 80386, 80486, Pentium 2, Architecture of the above processors in both uniprocessor and multiprocessor environment, Designing systems with microprocessors, Coprocessor and I/O processors, Interfacing with peripheral devices, Memory management and protection of 80286 and onwards processors. Application of microprocessors in (i) data acquisition systems, (ii) process control, (iii) signal processing and data communication, (iv) distributed computing and networking. Processor, memory and life management in UNIX/WINDOWS. Introduction to single chip microcontrollers: Intel MCS-51 family features - 8051/8031 architecture - pin configuration - basic assembly language programming & application examples. Interfacing ICs.

**ET/T/312 CONTROL ENGINEERING**


**ET/T/313 DIGITAL COMMUNICATION SYSTEMS**

boundary, Bay's likelihood ratio and its interpretation, Bay's strategy for detection of single sample value. Maximum likelihood estimation, Minimax test, Neyman-Pearson test etc. INFORMATION THEORY AND CODING Discrete messages, measure of information, entropy, information rate, coding to increase average information rate, Shannon's theorem, channel capacity, capacity of gaussian channel, coding: Introduction, Parity check bit coding for error detection, Coding for error detection and correlation, Block codes, coding and decoding, Algebraic codes, Convolution code, Probability error calculation.

ET/T/314 ANTIENNAS & PROPAGATION


ET/T/315 ANALOG CIRCUITS-II

1. MULTISTAGE AMPLIFIERS Frequency response of single stage R-C coupled amplifier, cascode amplifier, cascaded BJT and FET amplifiers, frequency response of R-C coupled multistage amplifier. 2. POWER AMPLIFIERS Analysis and design of class A, class B, class AB, class C, class D amplifiers, Design of heat sink. IC power amplifiers. 3. TUNED AMPLIFIERS Bandwidth consideration of tuned amplifiers, Analysis of single and double tuned amplifiers, Stagger tuning, Butter worth and Chebyshev response. 4. LINEAR WAVE SHAPING CIRCUITS RC high and low pass filter response for non sinusoidal signals, compensated attenuator, ringing circuit, measurement of L and C through circuit step response. 5. WAVEFORM GENERATOR oscillation criteria and oscillator circuits. Multivibrators, Blocking oscillator, Relaxation Oscillator, 555 timer as variable duty cycle square wave generator, Variable frequency LC and RC sine wave oscillators, Crystal oscillators. Linear time base circuits, PLL-architecture and applications, VCO architecture and applications, Synchronization and frequency division circuits. Bandwidth improvement with current feedback due to absence of Miller effect, the current mirror, current copier and current differentiating amplifier and their applications, Widler circuits. 6. SPECIALIZED LINEAR ICs
Multiplier (2208) IC, VCO, PLL, Balanced Modulators, Analog switches Track and hold circuits. 7. VOLTAGE REGULATOR Voltage feedback regulation, current limiting, series voltage regulator, three terminal IC regulators, switching regulators, switch mode power supply, regulators with thermal stabilization.

**ET/T/316 COMPUTER ORGANIZATION AND ARCHITECTURE**


**ET/S/311 ANALOG CIRCUITS LABORATORY-II**

Experiments related to "Analog Circuit-II".
ET/S/312 DIGITAL COMMUNICATION LABORATORY

Experiments related to "Digital Communication Systems".

ET/S/313 MICROPROCESSOR LABORATORY

Experiments related to "Microprocessors & Microcontrollers".

ET/S/314 CONTROL ENGINEERING LABORATORY

Experiments related to "Control Engineering".

Third Year Second Semester

ET/T/321 IC TECHNOLOGY & DESIGN

Introduction Discrete and Integrated Circuit; TTL, MOS and CMOS IC. PROCESS TECHNOLOGY Clean environment, wafer preparation, oxidation, diffusion, ion implantation, plasma etching and deposition, lithography, metallisation contact and interconnects, bipolar and CMOS processing. BASIC DEVICES Long channel MOS transistor equations; Large signal and small signal models; short channel and narrow channel effects; sub threshold region, SPICE Simulation models. ANALOG CMOS SUBCIRCUITS AND SYSTEMS MOS Switch, Active diode resistors and switched capacitor resistors; current sinks and sources, current mirrors and amplifiers, voltage and current references, differential amplifiers, cascade amplifiers; operational amplifiers; design of two-state and cascade op Amp. ANALOGUE CIRCUITS Comparators; Switched capacitor Amplifiers, Integrators, Filters; DAC and ADC circuits. MOS INVERTERS Definition and properties, MOS and CMOS inverter; VTC characteristics; Noise Margining Power consumption and Power delays product. BI CMOS CIRCUIT TECHNIQUE BI CMOS device and technology; Basic analogue subcircuits.

ET/T/322 COMMUNICATION SWITCHING SYSTEMS

TDMA, ALOHA, Slotted ALOHA, CSMA, persistent CSMA/CD, Token ring, Special access technique for mobile radio network. Spread spectrum basics, PN and FH sequence, CDMA techniques. Network protocols, 7 layers OSI architecture, Physical layer example RS232, Line coding, Data link layer ARQ techniques, Mobile communication basics.

**ET/T/323 DIGITAL SIGNAL PROCESSING**


Suggested Books:


**ET/T/324 DIGITAL CONTROL SYSTEMS**

**ET/T/325 SYSTEMS SOFTWARE**

Assemblers: Basic functions of assemblers, Design of one-pass and multi-pass assemblers, Cross-assemblers, MASM. Loaders and linkers: Absolute loaders, Subroutine-linkage, Relocating loaders, Direct linking loaders, Binders, Linking loaders, Overlays, Dynamic binders. Compilers: Different phases - lexical analysis, syntax analysis, intermediate code generation; Introduction to code generation and optimization, interpreters, compiler-compilers-YACC. Operating systems: Extended M/C view of an operating system, Operating system as an user interface, Operating system as a resource manager, Features of processor management module, memory management module, device management module and information management module, Case studies - UNIX, WINDOWS. Introduction to Text-editors and Debuggers.

**ET/S/321 MICROELECTRONICS AND VLSI LABORATORY**

Experiments related to "IC Technology and Design".

**ET/S/322 COMMUNICATION SWITCHING LABORATORY**

Experiments related to "Communication Switching Systems".

**ET/S/323 DIGITAL SIGNAL PROCESSING LABORATORY**

Experiments related to "Digital Signal Processing".

**ET/S/324 DIGITAL CONTROL LABORATORY**

Experiments related to "Digital Control Systems".

**Fourth Year First Semester**

**ET/T/411 COMPUTER COMMUNICATION NETWORKS**

**ET/T/412  OPTICAL FIBER COMMUNICATION**

Fiber optic communication principle for analog and digital signals. Passive and Active components for fiber optic communication: (a) Different optical fiber types, their wave guidance properties, alternation, dispersion and other characteristics. (b) Manufacturing principles of optical fibers, measurement of optical fiber parameters. (c) Passive fiber optic components: couplers, switches, gratings, optical connectors, optical filters, WDM filter, Bragg reflectors, optical isolators, optical circulators, Alternators etc. (d) Active components: Semiconductor LED, Laser diodes, Fibre amplifiers, PIN & Avalanche photodiode. Fiber optic Transmitters: For short hand and long hand communications, Fiber optic receivers, Repeaters for long hand communication, High bit rate digital optical communication systems. Use of WDM technology for high capacity system design Broadband fiber optic communication systems Analog Video transmission in CATV networks. Fiber optic networks: FDDI principles, LAN, MAN, WAN, B-ISDN using fiber optic technology. New hands in Fiber optic technology and their application to Fiber optic communication.

**ET/T/413  OPERATING SYSTEMS**


**ET/T/414  VLSI DESIGN**
Review of MOSFET characteristics, scaling and small-geometry effects, MOSFET capacitances. MOS inverters, CMOS inverter, static characteristics, switching characteristics, power dissipation issues. Combinational MOS Logic Circuits: MOS logic circuits with depletion loads, CMOS logic gates, complex logic gates, CMOS transmission gates, pseudo-nMOS domino logic gates, complex logic gates, CMOS transmission gates, pseudo-nMOS, domino logic gates. Multilevel gate circuits and design. Sequential MOS Logic Circuits: The SR latch circuit, clocked latch and flip-flop, CMOS D-latch and edge triggered circuits, Schmitt trigger circuit. Dynamic Logic Circuits: Pass transistor logic, synchronous dynamic circuit techniques, high-performance dynamic CMOS circuits. Semiconductor Memories: ROM circuits, SRAM circuits, DRAM circuits, drivers and buffers, design issues in memory and array structures. Low-Power CMOS Logic Circuits: Overview of power consumption, low-power design issues in memory and array structures. Low-Power CMOS Logic Circuits: Overview of power consumption, low-power design through voltage scaling, estimation and optimization of switching activity, quasi-adiabatic logic circuits, Multi-threshold CMOS,SOI-MOSFET design issues. BiCMOS Logic Circuits: Basic BiCMOS circuits, static behavior, switching characteristics in BiCMOS logic circuits, BICMOS applications. Input-Output Circuits: ESD protection, input and output buffer design, on-chip clock generation and distribution, latch-up and its prevention.

Books:


ET/T/415       MICROWAVE ENGINEERING

ET/T/416 ELECTIVE-I

1. Electromagnetic Compatibility
2. Software Engineering
3. Electrophysiology
4. Neuro-Fuzzy Control
5. Radar & Navigation

ET/T/416A ELECTRON DEVICE III

Optoelectronic and Display Devices: Photomultiplier tubes, photoconductive & photovoltaic cells, photodiode, avalanche photodiode, photo-Darlington and photoFET, Light emitting diodes, seven segment display, Dynamic scattering and field-effect LCD: operation & electrical characteristics, Gas discharge displays, Laser diodes, optoelectronic couplers. High Frequency Devices: p-I-n diode, IMPATT, TRAPATT, Gunn diode, Metal semiconductor field effect transistor (MESFET). Miscellaneous Devices: Thermistor, VVC diodes, Lambda diodes, Transferred electron devices. Quantum devices: Concept of quantum well and quantum confinement, Quantum wires and Quantum dots, Band gap engineering, Heterostructures, Superlattice, High electron mobility transistor (HEMT), Heterojunction bipolar transistor (HBT), Resonant tunneling diode (RTD).

ET/T/416B ELECTRONIC DESIGN AUTOMATION

PROCESS STEPS IN IC FABRICATION
NMOS, PMOS, CMOS and BICMOS processes. Device physics and models. Device physics of BJT and MOSFET. Short channel and hot electron effects. LDD and LDS structures, BJT models, Ebers-Moll and Gummel-Poon models, MOSFET models, Simple (Sah) model, BSIM and CSIM models, Small signal models of BJT and MOSFET, Model parameters, Device scaling. IC DESIGN
Design considerations for CMOS gates, Bipolar and CMOS RAM, ROM. Transmission lines. Hierarchical design, Procedural, structural and behavioural design, Standard cell and gate array design, Top down and bottom up approaches. SIMULATION
DC, AC and transient solutions, Delay analysis, Timing considerations, SPICE simulation, Parameter extraction, Optimization considerations with illustrative examples.

ET/T/416C AUDIO/VIDE0 ELECTRONICS & BROADCASTING

**ET/T/416D SOFTWARE ENGINEERING**

Introduction; Software life-cycle models; software requirements analysis and specification; Data-flow-oriented design, Data-structure-oriented design and object-oriented design; Coding, unit testing, integration, Validation and system testing; Software project planning, monitoring, maintenance and quality control. Software reliability and fault tolerance. Computer aided software engineering (CASE).

**ET/T/416E PRINCIPLES OF ELECTROMAGNETIC COMPATIBILITY**

1. Introduction
   1.1 Causes of EMI 1.2 EMI effects 1.3 EMC practices
2. Sources of Conducted Interference and its Characteristics
   2.2 Functional Sources.
   2.3 The conducted Spectrum.
   3. Characteristics of Interference
   3.1 Bandwidth
   3.1.1 Narrowband Interference
   3.1.2 Broadband Interference
   3.2 Amplitude Behaviour
   3.2.1 Thermal Noise
   3.2.2 Impulsive Noise
   3.3 Design Practice for Minimizing Conducted Interference
   3.3.1 Noise Source Treatment
   3.3.2 Modes of Operation
   3.3.3 Tube Design
   3.3.4 Arc Discharge
   3.3.5 Sensitive Device treatment
4. Sources of Radiated Interference and its Characteristics
4.1 Nature of Sources of radiated Interference.
4.1.1 Non-Functional Sources
4.1.2 Functional Sources.
5. Interference Coupling by Conduction and Radiation
5.1 Coupling via conductive Patches.
5.1.1 Resistive transfer
5.1.2 Inductive and Capacitive Transfer.
6. Grounding Bonding, Shielding and Filtering
7. Materials and Special Devices
6. Mathematical Models for Sources Coupling and Susceptors

**ET/T/416F NEURO-FUZZY CONTROL**


**ET/T/416G RADAR & NAVIGATION**

RADAR

NAVIGATION
ET/S/411   COMPUTER ARCHITECTURE AND SYSTEM SOFTWARE LABORATORY

Experiments related to "Computer Organization and Architecture" and "System Software".

ET/S/412   MICROWAVE LABORATORY

Experiments related to "Microwave Engineering".

ET/S/413   COMMUNICATION NETWORKS LABORATORY

Experiments related to "Computer Communication Networks".

ET/S/414   PROJECT

Specific project will be assigned by the teachers concerned.

Fourth Year Second Semester

MNG/ME/T/1   INDUSTRIAL MANAGEMENT

Growth of Industries, Management thoughts and scientific management, Taylorism; Factory system of production, Introduction to management problems, Types of manufacture, Planning analysis and control aspects in industries.
Types of business ownership, means of finance and business combinations, organization structures, committee organization, authority and responsibility, duty and span of control. Plant location, factory buildings and physical facilities, plant layout, tools and techniques of plant layout, materials - handling arrangements. Product development, standardization, simplification and diversification.
Functions of production, planning and control, production forecasting, production scheduling and network techniques, Gantt chart, CPM, PERT etc.
Work study, job evaluation and merit rating; purchase system and inventory control. Inspection and quality control of systems, statistical quality control, maintenance and replacement policies for machine and equipments; decision making theories, breakeven analysis cost benefit analysis, evaluation of financial and managerial efficiencies. Introduction to operational research techniques. Application of fuzzy logic in modern management concepts. Human relations in industry and labour compensation. Personnel management, provision of industrial legislations in India. Wage and salary administrations. Welfare and safety provisions, trade union acts. Study of environmental impacts and environmental laws.

Text Book:
Production and operations management: S.N.Chari

Reference books:
SATellite, MOBILE & PERSONAL COMMUNICATION

Historical development of satellites Indian-activities in satellite communication satellite system, Earth Station: The Antenna, High power amplifier, Low noise amplifier, VP connector, Down converters, conversion process, redundancy configuration. Satellite transponder, Transponder model, Channelisation, Frequency plans, Processing. Synchronous satellite communication relay by synchronous satellite, station keeping altitude stabilisation, power generation, solar cells, satellite earth terminal mutual interference, Communication link design & transponder. Frequency division multiple access principle, SPADE, FDM-FM-FDM. Time division multiple access principles, TDMA frame structure, super frame structure, Frame acquisition and synchronization. DSCDMA, D.S. spread spectrum system.

MOBILE AND PERSONAL COMMUNICATION SYSTEM


INSTRUMENTATION AND MEASUREMENTS

Errors in measurement: Absolute and relative, Observer error, Accuracy, precision and Resolution, systemic and random errors Transducers: Static and dynamic specification, Transducer for: Position-Potentiometers, LVDT, Optical Encoders, Synchros, Resolvers Force: Strain Gauge, Load cell, piezoelectric Velocity: Tachogenerators; Fluid: Pressure, flow, level transducers. Bourdon tubes, Bellows; Temperature: Thermocouple, Resistive Temperature detectors (RTD) Thermistors. Vacuum: Pirani gauge; Optical coupling and

Book:

Electronic Instrumentation and measurement by David A.Bell, Reston Publishing Co Inc, Prentice-Hall Co.

**ET/T/424 INDUSTRIAL ELECTRONICS**

Rectifiers: (a) Three phase Half wave, Full wave, Bridge and Double Y-type with interphase reactor. Behaviour of circuit with flywheel diode. Regulated Power supply, SMPS
Silicon Controlled rectifier: Single phase, Polyphase; Triggering Circuits. UJT, DIAC, application in DC motor control; PLC;TRIAC, Typical applications
Power FET, Inverters using SCRs,UPS
Industrial timer circuits; Resistance welding and its control
Induction and Dielectric heating. Magnetic Amplifier and Transconductors

**ET/T/425 ELECTIVE-II**

1. **OPTIMAL & ADAPTIVE CONTROL**
2. **COMMUNICATION NETWORK MANAGEMENT**
3. **OPTICAL NETWORKS**
4. **ADVANCED MOBILE COMMUNICATION**
5. **MONOLITHIC MICROWAVE INTEGRATED CIRCUITS**
6. **DISTRIBUTED SYSTEMS**
7. **COMPILER DESIGN**
8. **EMBEDDED SYSTEMS**

**ET/T/425A OPTIMAL AND ADAPTIVE CONTROL**

Introduction to optimal control
Performance measure for optimal control problems, the principle of optimality, Concept of dynamic programming, The Hamilton-Jacobi-Bellman Equation
The calculus of variation
Fundamental of a single function, Functionals involving several independent functions,
Constrained minimization of functionals.
The variational approach to Optimal Control problems
Linear regulator problems, Potryagin’s minimum principle and state inequality
constraints, minimum time and minimum control-effort problems.
Estimation techniques, least mean square, Maximum likelihood.
Adaptive control systems, Model reference approach for controller design. Neuro-Fuzzy
adaptive control Design and analysis of controller using MATLAB and SIMULINK

**ET/T/425B  COMMUNICATION NETWORK MANAGEMENT**

Overview of Telephone and Data Communication networks & topologies.
Network controllers, Internet configuration, Internet Fabric Model.
Overview of gateway communication & subnetworks
Common Network Problems
Network management systems (NMS), principle and functions
Network management standards, Network management model: Organization
Model information model and its structure (ASN-I)
Simple network management (SNMP-version I) SNMP communication model,
Access policy & protocol, SNMP-Macro, SNMP operations.
The information Model: Management information base (MIB) module;
Example. The IP Group, IP routing and forwarding; ICMP and TCP groups, An SNMP
MIB group.
The SNMP-version 2 its structure.
SNMP management: Remote Monitoring (RMON) RMON SMI and MIB;
ATM RMON MIB; A case study of Internet traffic using RMON
Broad band multimedia service: ATM SONET;HFC;ADSL WAN, Mobile & Broadband
Access Service, Principle of Broadband Network Management, Management of ATM
LAN
TMN-Model & its relationship to data & Telecom Networks: TMN- Standards, Services,
Functions & Architecture.
Network Management Tools: For trouble shooting of problems; Bit error rate
Trested, Protocol Analyzer, Traffic load Monitor etc.
Global view of Network, Network Management Applications. Web-based Network
Management.

**ET/T/425C  OPTICAL NETWORKS**

Introduction; Review of Optical Technology – propagation of signals in optical fiber,
components, modulation and demodulation, transmission system engineering;
Generations of optical networks, SONET/SDH, computer interconnects, Metropolitan-
Area-Networks, layered architectures; Broadcast and select networks – topologies,
Media-Access Control (MAC) protocols; Wavelength Routing networks- the optical
layer, node designs, network design and operation; Routing and wavelength assignment
(RWA) problems; virtual topology design; control and management; photonic packet switching.

**ET/T/425D  ADVANCED MOBILE COMMUNICATION**

**INTRODUCTION**
- Why Wireless Mobile communication
- Location dependent services
- Mobile and Wireless devices
- History of wireless communication
- A simple reference model

**WIRELESS TRANSMISSION**
- Frequencies for Radio Transmission
- Regulations act
- Modulation used
- Direct Sequence Spread Spectrum
- Frequency Hopping spread spectrum

**CELLULAR SYSTEMS**
- Cellular networks
- Frequency reuse
- GSM and its services
- GSM Architecture
- Protocol Architecture of GSM

**MOBILE TRACKING**
- Location updates and paging
- Handover
- Security
- Authentication/Encryption

**NEW DATA SERVICES**
- GPRS
- DECT
- UMTS and IMT-2000

**WIRELESS LAN**
- Overview
- Advantages/Disadvantages
MOBILE NETWORK LAYER

- Mobile IP: Goals
- Entities and terminology in MIP
- IP Packet delivery
- Agent advertisement and discovery
- Registration
- Tunneling: Encapsulation
- Reverse Tunneling
- Routing

ET/T/425E  MONOLITHIC MICROWAVE INTEGRATED CIRCUITS

Introduction
Why MMICS? Processing, MMIC performance, MMIC status, GaAs MMIC reliability, Yield cost, Future developments, MMIC applications: Military, Commercial and Consumer applications.

Network Parameters
Z, Y and h parameters, Properties of S parameters, Relationship between s-parameters and other parameters.

Noise Parameters
Thermal noise, Shot noise in two-port network, Noise figure and Smith chart, Noise temperature. Noise figure and noise voltage.

Device Modelling
Single-Gate FET, Basic operation, Device performance analysis, Characterization, Equivalent circuits and parameter extraction, Device modeling, Design considerations and applications, Noise modeling.
Dual-Gate FET, dc characterization and basic device operation, High frequency lumped element equivalent circuit, Applications of dual gate FETs.
Schottky Diodes, basic operation, Lumped element equivalent circuit, Semi-distributed element equivalent circuit, Applications and layout considerations.
Planer Lumped Elements, Planer capacitors, Planer resistors.
Transmission Lines, Microstrip and coplanar lines for MMIC’s Line discontinuities.
MMIC Design Considerations and Amplifier Design, Design consideration for MMICs, Chip size, Thermal design and wafer thickness, Low-inductance grounds and crossovers, Propagation modes and other design considerations.

Biasing Techniques
Microwave Amplifier Design, Design considerations, Procedure for general design of an amplifier, Design examples, 2-18 GHz distributed amplifier, 2-6 GHz feedback gain module, Low-Noise amplifier design, Circuit performance, Combining techniques for power amplifiers.
On-Chip Tuning, Tuning techniques using addition of elements. Airbridge removal technique.
MMIC Design, Nonlinear and control circuits mixer circuit design, Linearization, Device models, Distributed mixer design.
Phase Shiffer Design, Design approach, Design examples, Conclusion. Double and Single Balanced Mixer Design.
Variable Attenuator and Switch Design.
Nonlinear FET Operation and Selection, Variable Attenuator Design Measurement Versus Simulation.

**ET/T/425F  DISTRIBUTED SYSTEMS**

Concept of Distributed Systems: Definition, Enslow’s model, Motivation and Objectives, Application areas.
Inter Process Communication : Building Blocks, Client Server Communication, Case Studies.
Remote Procedure Call (RPC) : Design Issues and Implementation, Case Studies – SUN, ANSA, Asynchronous RPC.
Distributed Operating System : Kernel definition of Process and Threads, Naming and Protection, Communication and Invocation, File Server, SNS Name Service Model.
Timing and Coordination : Synchronization, Physical Clocks, Concept of Logical Time and Logical Clocks, Distributed Coordination.
Replication : Basic Architectural Model, Consistency and Request Ordering, Gossip Architecture, Process Group and ISIS.
Shared Data Transaction : Conversation between Client and Server, Simple Distributed Transaction and Nested Transactions, Automatic Commit Protocol, Concurrency Control, Distributed Deadlocks, Transactions with replicated data.

**ET/T/425G  COMPILER DESIGN**

The Structure of a Compiler Lexical Analyzer : Regular expression, Finite Automata, NFA, DFA, Minimizing the number of states of a DFA, Implementation issues, Introduction to LEX.
Syntactic specification of a programming language, Context-free grammar, Derivation and Parse trees, ambiguity.
Basic Parsing Techniques: Shift Reduce parsing, Operator-Precedence parsing.
Top Down parsing, LL(1) parsers.
Bootom up Parsing, LR parsers, LR(0) items, construction of SLR parsing table.
Introduction canonical LR parsing, LALR parsing table. Use of ambiguous grammars
for LR parser implementation. Introduction to YACC.
Syntax Directed Translation, Intermediate code, Postfix notation, Three address codes –
quadruples and triples. Translation of assignment statement, Boolean expressions, control
structures, arrays.
Run-Time Storage Administration and Symbol Table Management
Data-Flow Analysis, Code Optimizations.

BOOK:

V. Aho and J. D. Ullman, “Principle of Compiler Design”, Addison-Wesley/Narosa
Publishing House.

ET/T/425H  EMBEDDED SYSTEMS

Introduction; architecture; specifications; design methodologies; real time issues-
modeling, specification, communication, scheduling, protocols etc; Hardware-software
co-design, approached to software and code generation, memory and low power issues,
validation approaches; distributed embedded systems.

ET/T/426  GENERAL VIVA-VOCE

Based on the theory and sessional subjects of B.E.T.C.E course.

ET/S/421  INDUSTRIAL ELECTRONICS LABORATORY

Experiments related to " Industrial Electronics".

ET/S/422  SEMINAR

Seminar on some current topic in electronics and telecommunication engineering.

ET/S/423  PROJECT

Specific project will be assigned by the teachers concerned.