M.Sc (Electronics)

FIRST SEMESTER

Paper –I : **EL-101 Electronic Materials**

Unit-1 Fundamentals of materials science – Relative stability of Phases ,Phase rule,Phase Diagram, **Phase Transformations** : Elementary idea of Nucleation and Growth, methods of crystal growth.

Defects in crystals : Elementary idea of point, line and planar defects.

Materials in thin film form : Concept of thin films, preparation of thin films, deposition of thin film using sputtering methods (rt and glow discharge).

Unit-2 Special Materials in Electronics :

Composite materials : Composites of glasses, polymers metals and ceramics, properties and applications.

Polymers : Mechanism of polymerination, conducting polymers, application of polymers in electronics.

Metallic Materials : Functional gradient materials, shape memory alloys, amorphous materials, IC package materials.

Liquid crystal polymers: Optical properties of cholesteric and chiral nematics liquid crystal displays, optical fibre materials.

Unit-3 Dielectric and Ferroelectric Materials :

Dielectric materials as capacitive elements, polar dielectrics, properties and applications in electronics.

Ferroelectrics : physical properties and classification, properties modifications, non-linearities, applications in electronic devices.

Unit-4 Magnetic materials :

Ferromagnetic materials and their application transition metals and alloys as ferro-magnets, hard and soft magnetic materials.

Ferrites : Elementary idea of spinels. Garnets and Hexagonal ferrites, application of ferrites in electronics, magnetic bubbles.

Books Recommended :

1. Material science in engineering :V. Raghavan
2. Element of material science and Engineering :L.H.Van Vlanck
3. The structure and properties of materials : R.M. Rose and J.Wulf
4. Liquid Crystal : S.Chandrasekhar
5. Material Science, C.M. Gupta.

PAPER - II : EL-102 : ELECTRODYNAMICS

UNIT-1 Gauss's law, Scalar potential, Poisson's and Laplace equation and their solution in Cartesian coordinates, Electrostatic potential energy. Dielectrics and its polarization. Polarization of non-polar molecules (Classius- Mossatti relation). Bio – Savart Law . Vector Potential, Ampere's Circutial law , Energy Density in Magnetic field.

Unit –II Maxwell's equation in terms of Scalar and Vector potential , Gauge transformations, Lorentz and Coulomb gauge . Retarded potentials. Radiation from an oscillating electric and magnetic dipole with simple applications.

Unit-III Polarization by reflection, Total internal reflection, Electromagnetic waves in conducting medium, Normal and anomalous dispersions.

The dielectric tensor of an anisotropic medium, the structure of monochromatic plane wave in an anisotropic medium, the phase velocity and ray velocity . Fresnel's formula for the propagation to E.M. waves in crystals.

Unit-IV Wave guides and resonant cavities, cylindrical cavities and wave guides, modes in rectangular wave guides, energy flow and attenuation in wave guides, modes in rectangular. Resonant cavities , power losses in cavities.

Books Recommended :

1. Classical Electrodynamics :Jackson .J.D
2. Introduction to electrodynamics : Griffith D.J.
3. Optics : Mathur B.K.
4. Electromagetrics : Laud.B.B.
5. Electrodynamics, Satya Prakash

Paper -III: EL-103 : INTEGRATED DEVICES AND CIRCUITS

Unit-I The feedback concept, Generalized voltage and current feedback(series and shunt).General characteristics of negative feedback amplifiers, current and voltage feedback circuits, Emitter follower, Amplifier distortion, amplifier classification and characteristics, power and efficiency of amplifiers, Direct and Transformer coupled amplifiers , theory and applications of class A push-pull amplifier, working principle of class-B push-pull amplifier.

Unit-II Basic operational amplifier, Differential amplifier, transfer characteristics of a differential amplifier, IC operational amplifier, OP-AMP parameters and their frequency response. Application of OP- AMP as adder, substractor, active filter, Noise in OP-AMP.

Unit-III Differentiating and Integrating circuits, Clipping and Clamping circuits, comparators, Multi-vibrators, waveform generators (sine, square and triangular), Frequency to voltage and Voltage of frequency conversion.

Unit-IV Active filters, Butterworth and Chebyshey, Salen and Key filters, Low and High Band Pass/Reject filters.
Fundamental definitions related to Opto-electronic devices, photo conductive sensors, application of photodiode and photo-transistors(light operated relays and paper tape reader). photo multiplier tube. Light emitting diode, photo couplers.

Books Recommended :

1. Integrated Electronics : Millman & Haikias
2. Electronic Devices & circuits : Mottershed
3. Electronic principles : Malvino
4. Operational Amplifiers : Clayton
5. Communication Electronics : Deshpande, Deshpande & Rangole.

Paper-IV:EL-104: DIGITAL ELECTRONICS

Unit-I Logic gates , Boolean Algebra, Simplification of logic circuits using Karnaugh map, Number system and codes, Signed Binary Numbers, Representation of fractions, Arithmetic circuits, Adder, Sustractor, Code Convertor-decoder, Multiplexers and De-multiplexer, Seven segment and Dot matrix display.

Unit-II Logic families, TTL circuits, Totem-pole output, TTL parameters, TTL NAND gate, Open collector gates, Tri-state TTL Devices, external drive for TTL load, MOS Logic, Enhancement type MOSFET , CMOS characteristics, TTL and C-MOS interfacing.

Unit-III Flip-Flops R-S, D, T, J-K and Master slave J-K . Flip-Flops Registers, Buffer and shifts Registers , Binary Ripple counter of Mod-N. Synchronous counters , Ring counters, semiconductor memories, Memory Addressing logic, ROM, EPROM & RAM memories.

Unit-IV D-A Conversion : Weighted Register and Ladder Method ,Sample and hold Circuit ,A-D convertor, Simulation methods, Continuous method, Counter method, Successive approximation. A-D Accuracy , Resolution, Digital clock, Digital Voltmeter , Digital Frequency meter.

Books Recommended :

1. Digital Principles & Application : Malvino & Leach
2. Compter System Architecture : Moris Mano
3. Digital Electronic : Schaum Series
4. Digital Electronics Circuits : Samuel Lee
5. Digital Electronics : R.J.Tossi (PHI)
6. Digital electronics : R.P. Jain
7. Measurements & Instrumentation, Abhay Mansingh & M. Sayer.

Paper -V : EL-105: BASIC ELECTRONIC LABORATORY

Experiments based on Semiconductor devices & digital electronics concepts, are to be performed as assigned by the department.

PAPER -VI : EL-106 - MINOR PROJECT WORK

Every student shall be assigned a minor project work involving the design and study of some elctronic circuit/ devices, etc. so as to provide them experience in designing and understanding the aspects. It is aimed at generating self confidence and giving practical experience.

SECOND SEMESTER

Paper -I : EL-201:SIGNALS AND SYSTEM

UNIT-1 Signal and System Modeling Concepts: Introduction of signal and system analysis, few examples of system, signals models**, c**lassification of signals, energy and power signals, energy and power spectral densities

UNIT –II System modeling and Analysis in Time Domain: Introduction to system modelling concepts, The superposition integral for fixed linear system , Coinvolution integral, Evaluation of convolution integral , Impulse response of a fixed linear system, superposition integral in terms of step response , stability of linear system modelling and simulation .

UNIT –III State Variable Techniques : Introduction, state variable concepts from the state equation, Time domain solution of state equation, frequency domain solution of state equations, finding the state transition matrics, equations for discrete system .

UNIT –IV Discrete time signal and system: Introduction analog to digital conversion, Z- Transform, difference equations and discrete time system, examples of a discrete system ,

Books Recommended :

1) Signal and system : Continuous and discrete Second Edition.Maxwell Macmillan - Internal Edition 1990 : Rodger , E- Ziemer .
2) Electronic signal and system (English Lanuage book socity, Mac Millan low priced edition , 1990) : Paul A. Lynn .
3) Introduction to signal and systems (Second edition) : Edward W. Kamen .
4) Signal and System : Copper .

Paper-II : EL- 202 : ELECTRONIC COMMUNICATION METHODS & RADAR

UNIT –I Amplitude modulation and Demodulation : Amplitude modulation: Current collector modulation , Square law modulation , Suppressed carrier balance modulator . study of amplitude modulated transmission , square law detector , distortion in linear diode detector

UNIT –II Frequency Modulation and Detection : Reactance tube modulators, frequency modulation varactor diode, Armstrong Method of frequency modulation , frequency stabalization , F.M. receiver receivers , Limiters , F.M. detectors .

UNIT – III Introduction to digital communication, Sampaling and Quantization, Time division multiplexing. Pulse Code Modulation, PCM encoding, delta modulation, Differential PCM ,Adaptive delta modulation.

UNIT-IV Radar Communication: Contineous and pulse Radar system , General study of pulse Radar using A type indicator , Radar preformance factors , Radar Transmitting systems , Rotatory spark gap modulators , Hard value pluser, Radar waveform range determination, Radar Antenna Duplexer , Radar receiver , Automatic tracking Radar , Doopler effect in Radar.

Books Recommended:

1) Modern Electric Communication : Miller .
2) Electronics Communication : Raddv . G. and Collen .J.
3) Electronic Fundamental & Application : Kennedy
4) Principle of Communication System : Taub & Schilling .
5) Electronic Fundamental & Application : Ryder I.D.

Paper-III : EL-203 SEMICONDUTOR DEVICES & FABRICATION

UNIT –I Junction & Contacts : P-N homojunctions, Thermal equilibrium, Depletion region, I-V Characteristics, Hetero junction model, current transport, Hetro junction parameter and criterian for material slection, Application of Hetro junctions, Ohmic contacts, Metal Semiconductor contacts.

UNIT –II Devices and application : SET, MOSFET, MOS–Diode, Micrwave devices , Tunnel diode , IMPATT , Light emmiting diode , Photovoltic solar cell , Characteristics , efficiencies , Fill foctor , voltage factor , effect of series and shunt resistance , Material selection

UNIT –III Materials For Integrated Circuits and Fabrication Technology : Classification of IC's, Electronic grade silicon, Silicon shaping lapping phlishing and wafer preparation, Vapour phase epitaxy, Molecular beam epitaxy, Optical lithography, Photomask, Photoresistand process, Limitation of optical Lithography, Idea of electron and X-ray Lithography, Wet chemical etching, reactive plasma etching.

UNIT-IV Microelectronic Fabrication: Fabrication of monolithic diodes, Fabrication of integrated transistors, idea of burried layer fabrication, Monolithic circuit layout and design rule, Isolation methods, Monolithic FET, MOSFET, Processing idea of HEMT (High Electron Mobility transistor), CCD, MOS integrated circuit, Large and medium scale integrated, Hybrid Integrated circuit.

Books Recommended:

1) Integrated Electronics : Milliman and Taub
2) Microelectronics : Milliman and Gros
3) Thin film Phenomenon : K.L. Chopra
4) Hand Books Of Thin Film : Marshel and Gland
5) Physics of Semiconductor devices : Michel Shur
6) IC Fabrication : J.A. Ellcott
7) Physics of Semiconductor Devices : S.M. Sze
8) Solid State Devices : Streetman
9) Physics of Semiconductor Devices : Dilip K. Roy

Paper-IV : EL-204 COMPUTER APPLICATION IN ELECTRONICS

UNIT-I Architecture of 8085: Organization of microprocessor(8085), General purpose resistors and register pairs, Concept of slage and their uses, General processing unit of microprocessors, Timing and control unit , Fetch and execute cycle, General discussions about input/output of microprocessors, I/O Section, Useful I/O facilities and their control Concept of interfacing ,Types of interfacing devices, Interrupt facility advantage and disadvantage of interrupts, Simple interrupts system ,Direct Memory Access(DMA).

UNIT-II Assembly Language Programming: Concept of assembly language and assembler, The instruction of 8085,Op-codes, Mnemonics, Machine language and instruction cycle, Addressing techniques ,Direct immediate, Relative indirect and indexed addressing, single address computer Organization, The memory reference instructions, Loop jump, Instructions Addressing Modes Stack, Call, Return instruction and their routines.

UNIT-III Introduction to Computer System & "C" Programming : Basic idea of computers, I/O devices, Programming concepts "C" Programming structure, Data types, Constant , Variable, Assignment declarations & expressions, Statement, Symptoic Constant, Different types of operators, Integers, Floating point in "C" , Data input and output controls, Printf and Scanf function, Putchar, Getchar, Arrays.

UNIT-IV Control statements and Decision making in "C" , If-else statement, Nesting of If in statement, While loop, do-while loop, For loop , Nesting of for loop, Newton-Raphson iteration method as example of "C" program, User defined Function, Function and structured programming, Local and global Variables, Declaration function, Arrays, Declaration , Initialization and processing of Arrays.

Books Recommended:

1) Digital Computer Electronics and Microprocessor : A.P. Malvino
2) Introduction to Microprocessor : A.P. Mathur
3) Digital System and Microprocessor : T.R. Padmanabhan
4) Introduction to Microprocessor : La Leventhal
5) Microprocessor Assembly Language and Architecture :
6) Microprocessors : B.Ram
7) Fundamental of Computer : B. Ram /Rajaraman

Paper-V : EL-205: DIGITAL & COMMUNICATION ELECTRONIC LABORATORY

Experiments based on communication & digital electronics concepts are to be performed as assigned by the department.

PAPER-VI : EL-206 - MINOR PROJECT WORK

Every student shall be assigned a minor project work involving the design and study of some elctronic circuit/ devices, etc. so as to provide them experience in designing and understanding the aspects. It is aimed at generating self confidence and giving practical experience.

THIRD SEMESTER

PAPER-I : EL-301: COMMUNICATION ELECTRONICS

Unit-I Microwave Electronics. Characteristics. feature of microwave Application of microwave, Generation of microwave by tubes, Limitation of conventional tubes, Klystron ,Reflex Klystron, Magnetron, Travelling wave tube.

Unit -II Definition of microwave, Microwave - power-measurement, Impedance measurement, Frequency measurement, VSWR measurement in wave guide, Isolator, Modulator. Directional Coupler, Magic tree.

Unit -III Transmission Lines: Voltage and Current equation for transmission lines, Reflection and transmission coefficient, Standing wave and standing wave ratio, Impedance matching.

Unit -IV Antenna Theory: Radiation Mechanism, Elementary doublet, Current and Voltage antennas, Resonant/ Non Resonant Antennas, Antenna Gain, Beam width , Polarization, Directivity, Radiation Resistance, self and mutual Impedance , Dipole array, Hog Antenna.

Books Recommended:

1. Microwave: K.C. Gupta
2. Microwave circuits: A. Y. Liyo
3.Electronics communication system; George Kenedy
4. Electronics communication: Sanjeeva Gupta
5. Antenna (MGH): Kraus

PAPER-II :EL-302: FIBRE OPTIC'S & OPTICAL COMMUNICATION.

UNIT-I Optica1 fibre modes and configuration, fibre types, Ray optics, representation, mode of the circular waveguide, Waveguide equation, Wave equation for Step index fibre, Model equation, modes in step index fibre, power flow in step index fibre.

UNIT -II Fibre Material fabrication attenuation, Absorption, Scattering losses. Radiative losses, Core & Cladding Losses, Signal distortion in optical waveguide, Information capacity determination, Group delay, Material Dispersion, Wave Guide Dispersion.

UNIT-III Light Emitting Diode, Light source Material, Internal Quantum Efficiency, Modulation capability, Transient Response, Power band width product, LASER diode, LASER -diode structure and Threshold Conditions, Model properties and radiation pattern modulation.

UNIT -IV Temp effects, Idea *of* power launching and coupling idea *of* integrated optics, Fundamental receiver operation, Digital, signal transmission, Error sources, Receiver configuration Digital receiver performance calculation, Receiver noise; Shot noise, Pre-emplifier design, High impedance FET amplifier.

Books Recommended:

1. Optics Fibre: G. Keiser
2. Opto e1ectronics : Ghatak

PAPER-III : EL-303 DIGITAL COMUNICATION & NETWORKING

UNIT-I Digital Modulation Techniques: Introduction, BPSK, DPSK, QPSK M-ary FSK minimum shift keying, Duo binary coding. Coding: Introduction, Parity check bit, coding for error detection and correction, Binary block codes, coding and decoding, Examples of algebraic code, Burst error correction, Convocation coding & decoding.

UNIT-II Noise and Information Theory Regmter Noise: Noise temperature: Noise band width, Noise figure & noise bandwidth cascaded amplifier. Information Entropy, Mutual information, information rate coding to increase- average information per bit, Shannon's theorem, channel capacity, capacity of Gaussain's Channel.

UNIT -III Computer network & communication Transmission media, data transmission circuit, Types of network (Packet and message switching techniques), Network topologies, wide' metropolitan and local area network, layered network, architecture, network protocols, network interfaces and standards modems, RS-232 C, X-25, IEEE 802.

UNIT-IV Advanced Communication System: Evolution of Internet, internet Architecture; goals and key issues related to internetworking technologies; internet connectivity (dial up, dedicated lines, broadband, DSL, radio, VSAT etc.) Domain name-scheme, Technology and tools relevant for web access- (FTP, E-mail, search tools etc.). Internet Security. Satellite communication, Mobile Radio, Optical communication, ISPN, View of Telecommunication.

Books Recommended:

1. Communication system: Simon I Laykins.
2. Principle of Communication system: Taub & Shilling
3. Electronic Communication: Kenedy
4. Electronic Communication: D.Roddy &Toolen
5. Computer Network: Tanenbaum

PAPER-IV : EL-304 SENSOR AND TRANSDUCERS

UNIT-I Optical sensors: Spectral response, Photoconductive sensors, Junction type photoconductors (PIN and PIN diode, NPN), Photo diode, photoresister, Application of photodiodes and photoresister in light operated relays, Electro-optics, shaft encoder, Photo-voltaic sensors, Photo emmisive-sensors.

UNIT-II Transducers-I. Classification of transducers, Selecting a transducers, strain gauge, Gauge factor, Metalic sensing element, Gauge configuration, Idea of displacement transducers, capacitive and inductive transducers, Variable differential transformer, Oscillation, transducer.

UNIT-III Ttansducers-II: Photoelectric transducers, Piezoelectric transducers, potentiometric transducers, velocity transducers, resistive thermometer, thermocouples, thermister characteristic, Thermister application, photosensitive devices, filled phototube, multiplier phototube.

UNIT-IV Oscilloscopes: Cathode ray tube, Electrostatic. screen of CRT, Idea of CRT circuits, Vertical deflection system, Horizontal deflection system, Delay line, Oscilloscope probes and transducers, Determination of frequency phase angle: and time delay measurements, Idea of storage oscilloscope, sampling Oscilloscope.

Books Recommended :

1. Electric Instrumentation and Measurment Techniques: W.D. Cooper & A. D Helfric.
2. Understanding Oscilloscopes: Sahny, Kulshrestha, Gupta.

PAPER-V

EL-305 MICRO PROCESSOR & COMPUTER SIMULATION LABORATORY

PAPER-VI

EL-306 MINOR PROJECT WORK

FOURTH SEMESTER

PAPER I

EL-401: MAJOR PROJECT WORK WITH DISSERTATION

PAPER II

EL-402: PRACTICAL TRAINING IN ANY OF THE FOLLOWING FIELDS.

(I) Communication Electronics.
(II) Fiber Optics.
(III) Electronic- Devices & Material Development.
(IV) Control Systems& Power Electronics.
(V) Information Technology and Web based Application, any other. related field.

PAPER III

EL-403: COMPREHENSIVE VIVA VOCE/TEST