Department of PG Studies and Research in Physics and Electronics

Programme Offered

1. **M.Sc. Physics**
2. **M.Sc. Electronics**

Master Of Science in Physics

PROGRAMME OUTCOMES

PO-1. Critical Thinking: Identifying the assumptions that frame our actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO-2. Effective Communication: Read, Write, Speak and listen clearly in English and Hindi (Bilingual).

PO-3. Social Interaction: Provide a social exchange between two or more individuals.

PO-4. Effective Citizenship: Demonstrate social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO-5. Ethics: Recognize different value and moral systems and correlate them with present system.

PO-6. Environment & Sustainability: To understand the responsibility to conserve natural resources and protect global ecosystems to support health & wellbeing.

PO-7. Self-Directed & Life-long learning: It focuses on the process by which students take control of their own learning, in particular how they set their own learning goals, locate appropriate resources, decide on which learning methods to use and evaluate their progress.

PROGRAMME SPECFIC OUTCOMES

PSO-1. Students are expected to acquire deep knowledge in physics, including the major areas of classical mechanics, quantum mechanics, electromagnetism, Nuclear and particle physics, electronics, modern physics and microprocessors.

PSO-2. Have fundamental and advanced level knowledge in physics so as to handle the computational tools and Scientific software.

PSO-3. Discover of physics concepts in other disciplines such as mathematics, computer science, Non-linear dynamics, Chemistry etc.

PSO-4. Have necessary skills and expertise in field of research and development and be able to apply experimental expertise in basic as well as advanced areas of physics. Students will be capable of oral and written scientific communication and will prove that they can think critically and work independently

Semester-1

Paper 1 Mathematical Methods
Course Outcomes

CO-1. Learn about the concept and uses of Tensors and Tensor algebra (Null tensor, addition, subtraction, inner product, outer product).
CO-2. Familiarized with different special functions like Associated Legendre Polynomials, Laguerre's Polynomials, etc. and their solutions in solving different physical problems.
CO-3. To obtain knowledge of Fourier and Laplace Transforms in solving different problems of Mechanics and Electronics etc.
CO-4. Know about Green Function and its application in solving non homogeneous differential equations.
CO-5. Solve different physical problems which contain complex variables and implementation of complex variable for calculation of integrals, and also able to expand functions in Taylor's and Laurent's series. Knowledge of theorems of residues and contour integration.

Paper 2 Classical Mechanics
Course Outcomes

CO-1. Newtonian mechanics, Virtual work, DÁlembert's principle, Formulation of Lagrangian mechanics and problem solving with the help of it. Compare the formulation of Hamiltonian and Lagrangian mechanics and solve the problems of classical and relativistic mechanics
CO-2. Generating function, canonical transformation & Poisson brackets.
CO-3. Kepler problem, Legendre Transformations, Hamilton's equation, Canonical transformations and generating functions. Properties of Poisson's bracket.
CO-4. Understanding small oscillations, Solve the equations of coupled oscillator and to examine the twocoupled pendulums, and double pendulum related problems. Understanding rotating coordinate system, coriolis force and Eulerian coordinate system
CO-5. Understand space and time symmetries, covariant and four-dimensional formulation, covariant

Paper 3 Electronic Devices
Course Outcomes

CO-1. Understand working of Different Semiconductor devices like JFET, BJT, MOSFET & MESFET (Construction, Working Principles and V-I characteristics) and their applications.
CO-2. Understand photonic devices like LDR, LED and Diode Lasers along with their applications.
CO-3. Develop a comprehensive understanding of contemporary integrated circuits both saturated and unsaturated logic families like RTL, DTL, TTL TTC, ECL etc. Operational amplifier design and applications like adder, subtractor, differentiator function generator etc.
CO-4. Develop an insight into the physics and technology that go into the development of various memory devices using semiconductors and other electronic devices using elctro-acoustomagneto-optic effects. LCD. Piezoelectric effect based devices.
CO-5. Enjoy the new and stimulating ideas behind the future novel devices and also appreciate the link

Paper 4 Computational Methods And Programming
Course Outcomes

CO-1. Understand the basics of computer and BASIC programming. Estimate errors while solving equations and effectively use methods like matrix inversion, Gauss elimination and LU decomposition to solve linear equations.
CO-2. Understand the methods of linear and non-linear algebraic equations, simultaneous linear equations
CO-3. Enrich a given set of data points using interpolation methods, Newton's divided difference, etc.
CO-4. Numerically differentiate and integrate expressions and solve equations from physics.
CO-5. Enriched with various computational methods like Euler, Newton-Raphson and Runge-Kutta etc.to solve problems. Idea of random variables and Monte Carlo evaluation

Paper 5 Physics of electronics devices & fabrication of Intergrated circuits and systems
Course Outcomes

CO-1. Understand the basic concepts of various Inorganic and Organic Semiconductor materials for electronic device applications in modern electronic industry.

CO-2. Understand the carrier transport in semiconductors. Drift, Diffusion, Conductivity measurement, Direct and Indirect Band gap semiconductors.
CO-3. Analyze various junction devices: p-n junction, Schottky and MOS devices..
CO-4. Understand fabrication techniques of integrated devices such as thin film, vapor deposition, etching, lithography ,sputtering etc.
CO-5. Evaluate and understand behavior of semiconductor Electronics and their applications in design of various circuitry.

Semester-2

Paper 1 Quantum Mechanics- I

Course Outcomes

CO-1. To understand and apply principles of Quantum mechanics for understanding the physical systems inquantum realm.
CO-2. Importance of quantum mechanics compared to classical mechanics at microscopic level.
CO-3. To formulate the Heisenberg & Dirac formulation of quantum mechanics
CO-4. To solve the linear harmonic oscillator and hydrogen-like atom problems using Dirac formulation
CO-5. To demonstrate angular momentum operators associated with spherical and symmetrical systems and various tools to calculate Eigen values and total angular momentum of particles.

Paper 2 Statistical Mechanics

Course Outcomes

CO-1. To use various ensemble theories to calculate the thermodynamic properties of different systems.
CO-2. To compute properties of systems behaving as ideal Fermi gas or ideal Bose gas.
CO-3. To describe the features and examples of Maxwell-Boltzmann, Bose-Einstein, and Fermi-Dirac statistics.
CO-4. The student should be able to know Cluster expansion, Viril equation, Ising model and Landau theory.
CO-5. Understand the thermodynamic fluctuations, Langevin theory, Fokker-Planck and Onsager relations.

Paper 3 Electrodynamics and Plasma Physics

Course Outcomes

CO-1. Understand and apply the laws of electromagnetism and Maxwell's equations. Basics of electrostatics and magneto statics Solve the electric and magnetic fields problems for different configurations.
CO-2. Radiations by moving charges and retarded potentials. Fields of accelerated charged particle with different velocity. Angular distribution of radiated power. Abrahm- Lorentz method.
CO-3. Understand 4Vectors and Lorentz transformation in 4- dimensional space, relativistic transformation properties of E and H.
CO-4. Understand the plasma oscillations and its limit, Debye screening.
CO-5. Know Magneto hydrodynamic equations, magnetic diffusion, MHD flow, Pinch effect MHD waves.

Paper 4 Condensed Matter Physics

Course Outcomes

CO-1. Able to understand the X-ray diffraction and its use in crystal structure, Concept of reciprocal lattice, defects in solids and their observation.
CO-2. Able to understand the electronic properties of solids and understand the difference in the classical free electron theory, quantum free electron theory and the nearly free electron model.
CO-3. Able to understand types of polarizabilities, Hall effect and quantum hall effect. Superconductivity and high Tc superconductors.
CO-4. Able to understand ferromagnetism and its theory, Curie-Weiss law, magnetic order.
CO-5. Able to understand optical properties, Kramer-Kronig relations, cyclotron resonance, Raman effect

Paper 5 Informatics

Course Outcomes

CO-1. Use Fourier series and transformations as an aid for analyzing experimental data.

CO-2. Understand the principles of fiber optics communication in different media
CO-3. Intended to enrich the learner about transmission types, codes and communication. Modems and Transmission media.
CO-4. Introduction to UNIX/ LINUX, Programme with the C/ C++, Data types, Functions and Program structures.
CO-5. Able to know Object oriented concepts, the languages used to delivered web enabling technologies.

Semester-3

Paper 1 Quantum Mechanics – II
Course Outcomes

CO-1. Understand Approximation methods for bound states.
CO-2. Understand the Time Independent Perturbation Theory and its application.
CO-3. Understand theory of scattering, Born approximation and partial waves, Scattering by rigid sphere and spherically symmetric potential, Pauli spin matrices.
CO-4. Understand the central concept and principles of relativistic Quantum Mechanics.
CO-5. Understand Klein- Gordon equation, Dirac's relativistic equation, Zitterbewegung Dirac relativistic equation.

Paper 2 Nuclear And Particle Physics
Course Outcomes

CO-1. The method and analysis of Scattering process & understand structure and properties of nuclei, radioactive decay, and different types of nuclear reactions.
CO-2. Compare various nuclear models and properties of the nucleus & to study the nuclear structure properties.
CO-3. Various nuclear radiation detectors like Betatron and Synchrotron & describe various types of nuclear reactions and their properties.
CO-4. Nuclear decay processes and theory for beta and gamma decay.
CO-5. The nature, interaction etc. of the elementary particles and origin, nature of Cosmic rays. Bhabha-Heitler theory.

Paper 3 Condensed Matter Physics – I
Course Outcomes

CO-1. Mechanism of plastic deformation, Dislocations and their stress and strain fields, Multiplication, Dislocations in different types of lattices.
CO-2. Concept of Dislocation interaction and partial dislocations, Demonstrate techniques of microscopy for their observation. About elementary concepts of surface crystallography.
CO-3. Idea about thin films, their surface topography & electrical properties of thin films.
CO-4. Optical properties of solids, direct and indirect transitions, phonon absorption, skin effect.
CO-5. Able to define the concepts of Phonons and to understand the lattice dynamics of mono and diatomic lattices, Debye-Waller factor, UmKlapp process, interaction of electron and phonons with photon.

Paper 4 Electronics - I
Course Outcomes

CO-1. Know the basic phenomenon of communication, modulation and demodulation and their types. Knowledge of microwave transmission and parameters affecting along with Satellite communication and geostationary system.
CO-2. Gain knowledge about working, design and application of microwave devices and systems. Idea of Radar and Antenna system and related parameters.
CO-3. Enrich the learner about Microwave transmission lines and waveguides. Through it students would be able to understand the propagation of microwave through transmission lines and Waveguides.
CO-4. Get knowledge of 8085 microprocessor architecture and its functioning and ability to understand and design the microcontroller and microprocessor-based systems.
CO-5. Know the principle and working concepts of Interfacing devices like 8155/8255 and 8257 DMA and 8279 systems. Methods for digital and analog conversions.

Paper 5 Materials Science – I

Course Outcomes

CO-1. Able to qualitatively describe the bonding scheme and its general physical properties, as well as possible applications.

CO-2. Given a binary phase diagram, what microstructures can be obtained by suitable thermal treatments? examples for near-equilibrium and far-from-equilibrium processing.

CO-3. Able to identify phases (and their abundance), phase rule, and invariant reactions, as well as identify simple microstructures that can occur (including possible effects on mechanical response).

CO-4. Demonstrate techniques of microscopy for investigation on the nanometer and atomic scales

CO-5. Ability to know the basic instruments in materials science and engineering to characterize the structural properties.

Paper 6 Computational Physics – I

Course Outcomes

CO-1. General concepts and structure of C++ programming for developing computational methods.

CO-2. Review of instruments and related electronics used in computer controlled instrumentation. Idea of 8085 and 8086 based microcomputer system their programming and interface.

CO-3. Computation and the evolution of phase space as various parameters are changed.

CO-4. Solving problems related to propagation of elastic waves in solids, Phase trajectory of chaotic pendulum, Poincare section etc. Using computational techniques.

CO-5. To explore application of computational physics in frontier areas of Electronics such as electromagnetic oscillation in LC circuit, Fourier analysis in harmonic waves, circuits having LCR, acceleration of charged particle in cyclotron etc.

Semester-4

Paper 1 Atomic and Molecular Physics

Course Outcomes

CO-1. Able to deal with problems related to Hydrogen-like atomic spectra and alkali metals.

CO-2. Understand coupling schemes and hyperfine structures.

CO-3. Able to know the features of molecular quantum mechanics such as Thomas Fermi model, Hartree and Hartree-Fock methods.

CO-4. Able to understand the basics of microwave spectroscopy with rotation of diatomic molecules.

CO-5. Able to understand the basics of IR spectroscopy with vibrating diatomic molecules and vibrating –rotator molecule.

Paper 2 Physics of Lasers Its Applications

Course Outcomes

CO-1. Evaluate conditions for lasing phenomenon and properties of the laser.

CO-2. To understand various types of Lasers and their applications.

CO-3. To know about Laser fluorescence and Raman scattering and their applications.

CO-4. To understand the Optical fibers and use of Lasers in light wave communication along with the engineering and medical applications.

CO-5. To understand the basics of crystal optics and propagation of light ,electro- optical effects, laser induced multiphoton processes, parametric generation, optical stability etc.

Paper 3 Nonlinear Dynamics

Course Outcomes

CO-1. Understand basic knowledge of nonlinear dynamical systems, their equations, bifurcations, Poincare section.

CO-2. Understand dissipative systems, noninvertible maps, attractors, intermittency, Lyapunov exponents,

Henon map and Fractals and their geometry.

CO-3. Learn skills by solving problems on solving nonlinear problems using numerical methods.

CO-4. Understand Hamiltonian Systems, Integrability, Liouvill's theorem, perturbation techniques, Concept ofChaos and stochasticity.

CO-5. Understand advanced topics like Solitons, Sine Gordon and Kartweg devries, Baclund transformation, magnetic monopole and Vortex solitons.

Paper 4 Physics of Nanomaterials

Course Outcomes

CO-1. Understand concept of quantum confinement, electron confinement in deep square well and two and three dimensions, idea of quantum well, dot and wires.

CO-2. Understand quantum well and super lattices, techniques of fabrication of MQW and SL structures. Acquire knowledge of basic approaches like Bottom up and Top down to synthesize inorganic colloidalnanoparticles and their self-assembly in solution and surfaces, Physical properties of nanoparticles.

CO-3. Understand and describe the use of unique optical properties of nanoscale metallic structures using Luminescence and Raman scattering.

CO-4. Understand electrical properties, magnetic materials and stability of nano structures, Various applications and perspectives of nanotechnology in the development of value-added new products and devices.

Paper 5 Condensed Matter Physics – II

Course Outcomes

CO-1. Able to differentiate between type-I and type-II superconductors and their theories and explain the behavior of superconductors, applications and high temperature superconductivity.

CO-2. Understand the point defects, shallow impurity states and color centers.

CO-3. Understand structure and symmetries of liquid crystals, quasi crystals, Penrose lattice.

CO-4. Understand the physical and chemical properties of carbon nanotubes, methods of synthesis of nano structures, quantum size effect.

CO-5. Understand the crystalline, non- crystalline materials, disorder in condensed matter, atomic correlation, glasses and liquids, Anderson model, and amorphous semiconductors

Paper 6 Electroincs – II

Course Outcomes

CO-1. Understand digital communication systems such as PM, PAM, PCM, Delta modulations.

CO-2. Understand digital modulation techniques like BPSK, DPSK, QPSK, PSK FSK etc.

CO-3. Understand noise in pulse code and delta modulation systems, various noise parameters, signal to noise ratio.

CO-4. Understand computer communication systems, types of networks, design of networks, mobile and satellite network.

CO-5. Understand 8086 architecture and functioning, its assembly language programming, 8086 connection timings, Interrupts, digital and analog interfacing, elementary idea of Pentium processors

Paper 7 Materials Science – II

Course Outcomes

CO-1. To understand various mechanical properties and mechanism responsible for it. Failure of materials.

CO-2. To understand the dielectric behavior and polarization mechanism of materials.

CO-3. To understand the Polymer electrets and their applications, mechanism like Poole Frenkel, Richardson Schottky, tunneling and hopping inside the materials.

CO-4. To understand piezo, pyro, and ferro electric materials and their applications, to know about thin films, their deposition techniques, and electrical conduction, their magnetic and optical properties.

CO-5. To understand ceramics, glasses, and modern materials, their preparation and applications, modern materials like, liquid and quasi crystals, fullerenes, GMR materials, composite materials, bio polymers and conducting polymers.

Paper 8 Computational Physics – II

Course Outcomes

CO-1. Get a wide knowledge of Mathematica programming, its commands, numerical calculations like Factorial, exponential etc. Factorial, exponential & polynomials, Plots of data functions.

CO-2. To solve quantum mechanical problems in computational methods, like Schrodinger equations

CO-3. Solve propagation of free waves and through one dimensional well.

CO-4. Use computational methods to simulate phonon dispersion, density of states, two dimensional free electrons.

CO-5. Use simulation techniques to solve molecular dynamics with random oscillations, Monte Carlo and Ising model, magnetic susceptibility.

M. Sc. Electronics

PROGRAMME OUTCOMES

PO-1. Critical Thinking: Identifying the assumptions that frame our actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO-2. Effective Communication: Read, Write, Speak and listen clearly in English and Hindi (Bilingual).

PO-3. Social Interaction: Provide a social exchange between two or more individuals.

PO-4. Effective Citizenship: Demonstrate social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO-5. Ethics: Recognize different value and moral systems and correlate them with present system.

PO-6. Environment & Sustainability: To understand the responsibility to conserve natural resources and protect global ecosystems to support health & wellbeing.

PO-7. Self-Directed & Life-long learning: It focuses on the process by which students take control of their own learning, in particular how they set their own learning goals, locate appropriate resources, decide on which learning methods to use and evaluate their progress.

Programme Specific Outcomes

PSO-1. Students are expected to acquire deep knowledge of electronics to design a variety of components and systems for applications including signal processing, image processing, communication, networking, embedded systems, VLSI and control system.

PSO-2. Have fundamental and advanced level knowledge in Electronics so as to handle the computational tools andScientific software.

PSO-3. Select and apply cutting-edge engineering hardware and software tools to solve complex Electronics andCommunication Electronics problems.

PSO-4. Have necessary skills and expertise in field of research and development and be able to apply experimentalexpertise in basic as well as advanced areas of Electronics.

Semester-1

Paper 1 Electromagnetic Fields And Waves

Course Outcomes

CO-1. About basic phenomenon like electric field intensity, Gauss law and its applications, Divergence theorem etc.

CO-2. To obtain knowledge of boundary value problems and obtain their solution using keys like Laplace's and Poission's equations, Bio savert law, Stokes theorem, Scalar and magnetic vector potential and multi pole expansion.

CO-3. To understand Maxwell's equations, their integral form and uniform plane wave, basic knowledge about groups and types, skin effect and standing wave ratio.

CO-4. To obtain information about Transmission lines and electromagnetic radiations for accelerated charge and angular distribution of power radiation.
CO-5. To develop an understanding of relativistic electrodynamics by discussing transformation properties, Four vector and Lagrangian and Hamiltonian.

Paper 2 Properties Of Electronic Materials
Course Outcomes

CO-1. Conductivity, reflection and absorption properties, dielectric constant and polarizability, phase transition, piezoelectricity.
CO-2. Optical constant and their physical significance, Kramer kronig relations, colour of material, properties ofnano materials.
CO-3. Various theories related to types of magnetism, adiabatic demagnetization, magnetic domains.
CO-4. Electron and hole transport in semiconductor, experimental methods to study the electrical parameters, intrinsic and extrinsic semiconductors.
CO-5. Construction and working of semiconductor devices, JFET, MOSFET, negative conductance devices, IMPATT and TRAPATT and quantum well structure.

Paper 3 Signals And Systems
Course Outcomes

CO-1. Discuss the signal models, types, and functions, representation of systems, properties, stability and impulse response of a fixed linear system.
CO-2. Develop a comprehensive understanding of Fourier series and Transforms, Transfer functions, distortion less systems, Frequency translation, modulation, convolution etc., window functions and Gibbs phenomenon.
CO-3. Develop an insight into Laplace transform, various theorems related to transform of derivatives, integral, Laplace transform of convolution of two signals, network theorems (Thevenin and Norton's), Loop and node analysis.
CO-4. To understand and apply transfer function and frequency response of system for linear lumped stable systems, asymptotic and marginal stability, RouthHurwitz criterion, Bode plots etc.
CO-5. Evaluate and understand the behavior of discrete time signals and systems, analog to digital conversion, state variable concept, Frequency domain solution of state equations for discrete time systems, related examples, inverse Z transformation by the immersion signal.

Paper 4 Computational Methods in Electronics
Course Outcomes

CO-1. Know the various operating systems like DOS, OSII, GUI in general also multitasking UNIXshell, text processing in UNIX environment.
CO-2. Aware the elementary idea about compilers, interpreters, assignments and functions.
CO-3. Understand the interative methods, Matrix inversion, Eigen values and Eigen vectors of matrices.
CO-4. Enriched with numerical solution of ordinary Differential Equation, predictor and corrector methods.
CO-5. Understand the basic of oscillations in LC, RC and LCR circuits, Harmonic waves, charging and discharging incircuit with inductor capacitor and registers.

Paper 5 Digital Design And Applications
Course Outcomes

CO-1. Have an idea about number systems, logic gate characteristics and construction. Working and characteristics oflogic families for several applications.
CO-2. Numerically understand the Boolean Algebra, simplification of K- map and applications designing of various devices.
CO-3. Analyze various arithmetic circuits like Half adder, digital comparator, parity generator/ checker etc.
CO-4. Understand fabrication techniques of sequential circuits like flip flop counters and types.
CO-5. Evaluate and understand behaviour of shift registers and their types and applicability in electronic circuits.

Semester-2

Paper 1 Analog and Digital Circuits

Course Outcomes

CO-1. Understand the construction and working of Operational Amplifier including all parameters and specifications.

CO-2. Know the linear applications of Operational Amplifier and general idea about instrumentation amplifier and filters.

CO-3. Discuss and analyze the nonlinear applications of OP-AMP in the form of various devices.

CO-4. Formulate the Boolean functions, simplification of k map and generalization of combinational circuits

CO-5. Discuss the synchronous sequential machines, Mealy and Moore model machines, state table and transition diagram etc.

Paper 2 Optical and Quantum Electronics

Course Outcomes

CO-1. To know the general mechanism of photoconductivity devices like photodetectors, phtotransducer, photomultiplier tubes, impulse and frequency response etc.

CO-2. Know the mechanism of Luminescence, various models like configuration, coordinate and energy band model.

CO-3. To understand the outcomes of various effects discuss the mechanism related with laser.

CO-4. To understand the construction and working of types of LASER. Q switching.

CO-5. Understand the various applications of laser and applicability of nonlinear optics.

Paper 3 Network Analysis and Synthesis

Course Outcomes

CO-1. Understand the star and delta conversion, source transformation. Mesh and node analysis of electric circuits and network theorems.

CO-2. Know the coupled circuit's waveform, synthesis using functions their types and concept of network graph and network transformation.

CO-3. To explore application of network functions and time domain behaviour from the plots and understand the Nyquist stability criterion.

CO-4. To gain knowledge on two port network analysis with the use of parameters and their relationship.

CO-5. Solve the problems related with network synthesis by LCR and R-C cauers forms

Paper 4 Microprocessor and Object Oriented Programming

Course Outcomes

CO-1. Microprocessor architecture and its operation, memory interfacing, writing assembly language programs.

CO-2. Basic interfacing concepts, interfacing about displays and input devices and Programmable interrupt.

CO-3. Pin description, operation modes of resistors and internal architecture of 8086 and 8088 microprocessor, segment register and memory segmentation.

CO-4. Instruction set of 8085/8086 various data transfer instructions.

CO-5. Introduction to C++ and object-oriented programming, data Hiding and encapsulation, stack and queues.

Paper 5 Microwave Electronics

Course Outcomes

CO-1. Learn about the concept and uses of Microwave, generation of microwave by conventional vacuum tube.

CO-2. Know about bipolar and field effect transistor, gun oscillator and IMPATT and TRAPTT mode of operation.

CO-3. To obtain the basic knowledge of integrated circuit design, substrate materials, conductor and dielectric.

CO-4. To impart understanding of waveguide, Impedance Matching, element, tees and magic tees.

CO-5. Develop a comprehensive understanding of microwave measurement techniques and devices.

Semester-3

Paper 1 Integrated Circuit Technology

Course Outcomes

CO-1. Purification : Different techniques, redistribution of dopants and oxidation, induced defects ,general idea ofdiffusion mechanism.

CO-2. The method of metallization, selectivity and control rate of eatch rate and edge profile.

CO-3. Basic Monolithic integrated circuits, layout making and etching, packing and characteristics of integrated circuit components.

CO-4. Construction and characteristics of Differential and Operational amplifier, calculation of Operational Amplifier parameters, slew rate and methods of improvising slew rate.

CO-5. Op-Amp working modes, linear and nonlinear circuits using Operational Amplifier and their analysis.

Paper 2 Microwave And Digital Communications
Course Outcomes

CO-1. Ground space wave, Sky wave propagation, advantage and disadvantage of microwave transmission satellite system etc.
CO-2. Principle and operation of klystron, magnetrons travelling wavetube Impatt diode. Gun & Trapatt diode.
CO-3. Microwave system, repeater system, microwave antennas, Radar system and Satellite system.
CO-4. Pulse modulation system, sampling, Companding noise in system and various types of modulation.
CO-5. Various digital modulation techniques including BPSK, DPSK, QPSK, QASK and BFSK, internet and ATM network, Bluetooth and mobile computing

Paper 3 Control Systems
Course Outcomes

CO-1. Familiarized with the loop control Servo mechanism mathematical methods of physical system.
CO-2. Standard test signals, types of feedback, control system, design specification, effect of adding a system zero to asystem.
CO-3. Routh- Hurwitz stability criterion, Routh array construction rules, all pass and minimum phase systems.
CO-4. Stability criterion assessment of relative stability gain margin and phase margin closed-loop frequency response.
CO-5. The design problem tuning of PID controller feedback compensation behaviour of nonlinear system, phase plane method, general idea of analysis.

Paper 4 Electronics Instrumentation & Measurements
Course Outcomes

CO-1. Able to understand the concept of measuring concept of measurement error in measurement type of errors specification and testing of dynamic response.
CO-2. Able to know the working types and characteristics of transducers, measurement of velocity, force, strength, speed, flow, humidity and thickness etc.
CO-3. Understand the principle working and basic characteristics of digital instruments like DC amplifier isolation amplifiers and Signal Processing circuits i.e., peak detectors, RMS converter UPS.
CO-4. Acquire knowledge of basic approaches of Advanced measuring instruments like digital multimeter frequency metre and electrometer etc.
CO-5. Understand and describe the use of Biomedical electronic instruments and measurements like biochemical transducers cardiovascular and pacemakers.

Paper 5 VHDL
Course Outcomes

CO-1. Know hardware abstraction, entity declaration, configuration and package declaration.
CO-2. Understand the operators identifiers resolution functions.
CO-3. Get familiarized with modeling state, behavioral modeling and data flow modeling etc.
CO-4. Explain why configuration architecture configuration subprograms and overloading.
CO-5. Discuss read-only memory and Programmable Logic devices.

Semester-4

Paper 1 Microcontroller And Embedded Systems
Course Outcomes

CO-1. Understand architecture, specialties applications of embedded system, examples and categories of embedded systems challenges and issue in embedded software, memory advance hardware, etc
CO-2. Gain knowledge about Assembly language programming, concept of arithmetic and logic instructions jump loop and call instructions
CO-3. To understand architecture internal structure programming and addressing modes board controller 8279, interfacing of 8-bit A/D and D/ A converters.
CO-4. To know interrupt programming types of interrupt, Stepper Motors, traffic light control system with software development.
CO-5. To able to know registors, resistor file structure, features of a RISC and CISC architecture, comparison

andadvantages.

Paper 2 Cellular And Satellite Communication

Course Outcomes

CO-1. Understand basic knowledge of mobile and personal computers instrumentation for lab testing

CO-2. Learn skills by solving problems on pseudo noise sequence, hopping systems, carrier to noise and carrier tointerference ratio.

CO-3. Know specialized MAC multiple access with collision avoidance avoidance and mobile services

CO-4. Understand principle of satellite communication, satellite link module handover, Earth station configuration etc.

CO-5. Illustrate condition of INTELSAT, VSAT ,MAST, lower earth orbit satellite personal communication networks.

Paper 3 Digital Signal Processing

Course Outcomes

CO-1. The digital signals and their processing, sampling of continuous time signals Z transform of finite length sequence, right side left sided and both sided multiplication and convolution of sequences.

CO-2. Representation of periodic sequences, sampling the z transform, linear convolution using DFT, general introduction of FET, Goertzel algorithm , FET with different radix.

CO-3. Metric representation of digital networks, networks for linear phase FIR systems, parameter. quantization effects.

CO-4. Design examples of digital filters using impulse invariance and bilinear transformations, computer-aided design ofIIR digital filters, properties of FIR/nonrecursive digital filters comparison of IIR and FIR filters.

CO-5. Speech signals, analysis, compression and coding voice privacy application to radar and image processing continuous discrete wavelet transform.

Paper 4 Internet, Web Technology And Management

Course Outcomes

CO-1. Understand the network system, Topology, Modems Routers Gateways.

CO-2. Evaluate the server and client connectivity, world-wide-web(www) , FTP and Telent, ATM virtual and private networks.

CO-3. Understand Ethernet basics, Token passing protocols, Netware protocols, NOVEL Netware, simple network management protocol.

CO-4. Know the mechanism and features of URL's, DHTML, JAVA scripts interpreter plug-ins protocols.

CO-5. Analyze and discuss simple JavaScript and HTML, active page, working with images working in Frames the JAVA Script URL.

Paper 5 Nano-Electronics

Course Outcomes

CO-1. Understand the emergence of NanoTechnology, concept of quantum confinement, top-down and bottom-upapproaches for preparation of Nano structures.

CO-2. Know the tunneling structure, modulation doping of hetrostructures, carrier excition dynamics, ballistic transport, spintronics.

CO-3. Learn about various of heterojunctions FETs, three terminal electronic devices, multiple QW laser.

CO-4. Understand Nano grained structure, polymer nanocrystals. AC power electroluminescence and display devices.

CO-5. Illustrate doping of Si oxidation of silicon, methods of organic layers in BIOMEMS, Plasma sparying.