

# DEPARTMENT OF PHYSICS, SONAMUKHI COLLEGE

(Affiliated to Bankura University)

## *Programme Outcome, Programme Specific Outcome and Course Outcome for B.Sc. in Physics (Honours, GE and Prog) for Academic Session 2020-21 following CBCS Pattern*

The Department of Physics recognizes that curriculum, course content and assessment of pedagogic achievement play important roles in shaping education. The department is of the view that assessment should support and encourage the goals such as basic knowledge of the discipline of Physics including phenomenology, theories and techniques, concepts and general principles.

The programme aims to develop the following abilities in a student:

<b>Programme Outcome (PO)</b> <i>(Upon completion of the B.Sc. Degree Programme, the graduate will be able to.....)</i>		
PO No.	<b>Descriptions</b>	
<b>PO 1</b>	<b><i>Critical Thinking</i></b>	Acquire the ability to apply the basic tenets of logic and science to thoughts, actions and interventions.
<b>PO 2</b>	<b><i>Communication Skill</i></b>	Demonstrate the ability to justify and explain their thinking or approach both written and oral.
<b>PO 3</b>	<b><i>Problem Analysis</i></b>	Identify, formulate and analyze complex scientific problems for higher studies.
<b>PO 4</b>	<b><i>Systematic Approach</i></b>	Complete an experimental work, and report to the faculty by tabulating the readings and present the outcome of the experimental work.
<b>PO 5</b>	<b><i>Individual and team work</i></b>	Perform effectively as an individual and as a number or leader in diverse team, in multidisciplinary setting
<b>PO 6</b>	<b><i>Interdisciplinarity</i></b>	Perceive knowledge as an organic, comprehensive, interrelated and integrated faculty of the human mind.
<b>PO 7</b>	<b><i>Ethics</i></b>	Understand ethical principles and responsibilities of a physics graduate to serve the society.
<b>PO 8</b>	<b><i>Effective Citizenship</i></b>	Demonstrate empathetic social concern and equity-centred national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
<b>PO 9</b>	<b><i>Environment and Sustainability</i></b>	Apply and demonstrate the basic physics in environmental context for sustainable development.
<b>PO 10</b>	<b><i>Future Employability</i></b>	Enhance and adopt new skills for future employability in teaching and research through seminar, workshop.
<b>Programme Specific Outcomes (PSO)</b> <i>(Upon completion of these courses the student would .....)</i>		
PSO No	<b>Descriptions</b>	

<b>PSO 1</b>	Develop deep understanding of the basics of subjects like mechanics, optics, properties of matter, e-m theory, environmental issues related to physics so that they can pursue higher studies.
<b>PSO 2</b>	Understand and apply the principles of Mathematical Physics and Computational Physics and do Error analysis in measurements.
<b>PSO 3</b>	Organize and deliver relevant applications of knowledge through effective written, verbal, graphical/virtual communications and interact productively with people from diverse backgrounds.
<b>PSO 4</b>	Develop the proficiency in the acquisition of data using a variety of laboratory instruments and in the analysis and interpretation of such data.
<b>PSO 5</b>	Discover of physics concepts in other disciplines such as mathematics, computer science, chemistry etc.
<b>PSO 6</b>	Realize and develop an understanding of the impact of physics and science on society.
<b>PSO 7</b>	Learn to design an experiment (or series of experiments) demonstrating their understanding of the scientific method and processes
<b>PSO 8</b>	Apply appropriate techniques and modern tools to complex scientific activities
<b>PSO 9</b>	Acquire a range of general skills, to solve problems, to evaluate information, to use computers productively, to communicate with society effectively and learn independently.
<b>PSO 10</b>	Acquire a job efficiently in diverse fields such as Science and Engineering, Education, Public Services, Business etc.

**Course Outcomes (CO) for Physics Honours**  
(Upon completion of these courses the student would be able to...)

**Semester I**

Course (Hons)	Outcomes
C-1 Math Physics I	<b>CO 1:</b> Learn methods to solve first and second order differential equations. Familiarize with Wronskian. <b>CO 2:</b> Learn in details about vector calculus along with Gauss's theorem, Stokes's theorem. <b>CO 3:</b> Acquire knowledge in curvilinear coordinate systems <b>CO 4:</b> Understand Fourier Series and its applications <b>CO 5:</b> Learn various special functions and treatments of Legendre, Bessel, Hermite and Laguerre Differential Equations <b>CO 6:</b> Learn two special integrals: Beta and Gamma functions and their interrelation.
C-2 Mechanics	<b>CO 1:</b> Understand Newton's laws of motion, the concepts of linear and angular momentum and torque. <b>CO 2:</b> Determine the Centre mass of a given configuration <b>CO 3:</b> Understand the principle of work, energy and power <b>CO 4:</b> Determine angular momentum of a body about any given axis <b>CO 5:</b> Acquire knowledge about fluid motion, elasticity of materials <b>CO 6:</b> Understand special theory of relativity and its relevance.
P-1 Math Physics Lab	<b>CO 1:</b> Develop the concept of GNU plot and basic knowledge of error analysis, curve fitting, exporting plots.
P-2 Mechanics Lab	<b>CO 1:</b> Learn how to use screw gauge, slide callipers, microscope, telescope.

	<b>CO 2:</b> Know how to measure Young's modulus, coefficient of Viscosity, acceleration due to gravity, spring constant
<b>Semester II</b>	
C-3 Electricity & Magnetism	<p><b>CO 1:</b> Understand the concept of electric field, electric potential, magnetic field and magnetic potentials</p> <p><b>CO 2:</b> Apply method of images and Laplace equations as a special technique to calculate field due to conductors.</p> <p><b>CO 3:</b> Familiarize Biot-Savart's law and its application. Understanding of Amperes circuital law to obtain magnetic field due to current carriers.</p> <p><b>CO 4:</b> Acquire basic knowledge of electromagnetic induction: Faraday's law, Lenz's law, self inductance and mutual inductance.</p> <p><b>CO 5:</b> Understand electrical circuits using Kirchoff's law. Application of Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem.</p>
C-4 Wave & Optics	<p><b>CO 1:</b> Know simple harmonic motions (SHM) and superposition of N number of harmonic oscillations.</p> <p><b>CO 2:</b> Understand difference between progressive wave and standing wave.</p> <p><b>CO 3:</b> Know Interference pattern in view of division of amplitude and division of wavefront.</p> <p><b>CO 4:</b> Understand Diffraction and distinguish between Fresnel and Fraunhofer diffraction</p> <p><b>CO 5:</b> Understand the principle of holography and its applications</p>
P-3 Electricity and Magnetism Lab	<p><b>CO 1:</b> Learn the usage of multimeter to obtain different parameters of an electrical circuit.</p> <p><b>CO 2:</b> Understand and verification of different network theorems.</p> <p><b>CO 3:</b> Study the response of LCR circuits to understand basic parameters of electrical circuits.</p>
P-4 Wave & Optics Lab	<p><b>CO 1:</b> Acquire the knowledge to use Spectrometer, Prism, Grating,</p> <p><b>CO 2:</b> Know how to analyse spectra of sodium, Mercury.</p>
<b>Semester III</b>	
<b>Course (Hons)</b>	<b>Outcomes</b>
C-5 Math Physics II	<p><b>CO 1:</b> Learn complex numbers and understand details of complex line integral with special emphasis on Cauchy's integral theorem and residual theorem, Taylor and Laurent expansions.</p> <p><b>CO 2:</b> Familiarize with matrix algebra and learn to solve a system of linear equations by matrix method</p> <p><b>CO 3:</b> Understand probability and different probability distribution functions</p> <p><b>CO 4:</b> Learn Dirac- Delta function.</p> <p><b>CO 5:</b> Acquire knowledge in variational calculus in Physics</p>
C-6 Thermal Physics	<p><b>CO 1:</b> Understand the concept of temperature, the thermodynamic state and equilibrium.</p> <p><b>CO 2:</b> Explain the first law of thermodynamics through work and heat and its Mathematical Formulation.</p> <p><b>CO 3:</b> Understand the ideal gas equation and kinetic theory of gases</p> <p><b>CO 4:</b> Understand the second law of thermodynamics and</p>

	thermodynamic temperature scale. <b>CO 5:</b> Define entropy and thermodynamic potentials
C-7 Digital Systems and Applications	<b>CO 1:</b> Understand difference between Analog and Digital Circuits and different active and passive components in a circuit. <b>CO 2:</b> Understand the different number systems, conversions and binary arithmetic operations. Learn Boolean algebra and conversion of a Truth table into Equivalent Logic Circuit. <b>CO 3:</b> Acquire knowledge about different sequential and logic circuit. <b>CO 4:</b> Understand Timer circuit (555 Timer), Register and counters. <b>CO 5:</b> Knowledge about computer architecture and memory organization.
SEC-1 Renewable Energy and Energy Harvesting	<b>CO 1:</b> Understand the need of alternate renewable energy sources in place of conventional fossil fuels. <b>CO 2:</b> Knowledge of huge potentials of solar energy source and different mode of applications of solar power. <b>CO 3:</b> Acquire knowledge about different clean energy sources like tidal energy, wind energy, geothermal energy. <b>CO 4:</b> Working principles and specific applications of piezoelectricity and electromagnetic energy.
P-5 Math Physics II Lab	<b>CO 1:</b> Know programming language Python. <b>CO 2:</b> Solve Algebraic and Transcendental equations using Python programming language
P-6 Thermal Physics Lab	<b>CO 1:</b> Calibrate thermocouple and measure its thermo-emf. <b>CO 2:</b> Determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer. <b>CO 3:</b> Measure thermal conductivity of Cu by different methods.
P-7 Digital Systems and Applications Lab	<b>CO 1:</b> Design and verify different logic gates using ICs and by circuits with analog components like transistor and resistance. <b>CO 2:</b> Design and study 555 Timer circuit. <b>CO 3:</b> Familiarise with multimeter, power supply, signal generator and cathode ray oscilloscope.
<b>Semester IV</b>	
<b>Course (Hons)</b>	<b>Outcomes</b>
C-8 Math Physics III	<b>CO 1:</b> Understand linear vector space: Dependence and independence of vectors, algebra of linear transformation, orthogonal and unitary transformations. <b>CO 2:</b> Know the integral transformations: Laplace and Fourier transformations, basic properties and application to solve differential equations. <b>CO 3:</b> Familiarize with Eigenvalue and eigenvectors: Diagonalization of Matrices. Solutions of Coupled Linear Ordinary Differential Equations
C-9 Elements of Modern Physics	<b>CO 1:</b> Develop concepts of quantum phenomena: Phase velocity and group velocity, Photoelectric effect, Compton scattering, De Broglie hypothesis and wave particle duality. <b>CO 2:</b> Understand Heisenberg Uncertainty principle and emergence of probability and normalization of wave functions. Learn an introductory general prescription for quantum mechanical tools.

	<p><b>CO 3:</b> Understand the estimation of wave function associated with a system for different potential problems.</p> <p><b>CO 4:</b> Develop a general concept on radioactivity. Qualitative understanding of Alpha, Beta and Gamma rays, Nuclear Fission and Fusion, LASER.</p>
C-10 Analog Systems and Applications	<p><b>CO 1:</b> Understand p and n type semiconductors, construction of p-n junction and current flow mechanism in a p-n junction diode.</p> <p><b>CO 2:</b> Learn about BJT, FET, MOSFET and their applications specifically in amplifier circuit.</p> <p><b>CO 3:</b> Understand the feedback circuits, oscillators and power amplifiers</p> <p><b>CO 4:</b> Understand OPAMP basics and different OPAMP circuits</p>
SEC-2 Radiation Safety	<p><b>CO 1:</b> Learn about the basic concept of atomic structure, composition of nucleus, mass energy, isotopes.</p> <p><b>CO 2:</b> Understanding Radioactivity and different types of decay.</p> <p><b>CO 3:</b> Different radiation detectors and their working principle.</p> <p><b>CO 4:</b> Acquire knowledge about International Commission on Radiological Protection (ICRP) principles</p> <p><b>CO 5:</b> Learn different applications of nuclear techniques for the betterment of life.</p>
P-8 Math Physics III Lab	<p><b>CO 1:</b> Learn Programming Language SciLab along with Python.</p> <p><b>CO 2:</b> Develop knowledge of writing programme to get numerical answer of differential equation employing different standard models.</p>
P-9 Elements of Modern Physics Lab	<p><b>CO 1:</b> Experimentally verify Photo-electric effect.</p> <p><b>CO 2:</b> Understand the working principle of vacuum diode. Measure electronic charge by Millikan oil drop apparatus.</p> <p><b>CO 3:</b> Demonstrate diffraction pattern of laser using single and double slits</p> <p><b>CO 4:</b> Determine the Boltzmann constant using I-V characteristics of PN junction diode</p>
P-10 Analog Systems and Applications Lab	<p><b>CO 1:</b> Learn Characteristics of a transistor in different operational conditions. Design a amplifier circuit using transistor and other discrete circuit components</p> <p><b>CO 2:</b> Acquire knowledge about design and study A/D converter, inverting-noninverting amplifier using OPAMPs.</p> <p><b>CO 3:</b> Understand and test comparator and zero crossing detector circuits.</p>
<b>Semester V</b>	
<b>Course (Hons)</b>	<b>Outcomes</b>
C-11 Quantum Mechanics and Applications	<p><b>CO 1:</b> Understand general solution of time-independent Schrodinger equation: measurement of position, momentum, energy and other physical observables. General discussion on different aspects and properties of wave functions.</p> <p><b>CO 2:</b> Have general discussion of bound states in an arbitrary potential: particle in a box and simple harmonic oscillator as a model system. Concept of quantum mechanical tunnelling.</p> <p><b>CO 3:</b> Determine solution of Schrodinger equation in 3 dimensions: quantum theory of Hydrogen-like atoms, measurement of orbital angular momentum and different quantum numbers.</p>

	<p><b>CO 4:</b> Acquire details knowledge about atoms in electric and magnetic field: space quantization, electron spin, Zeeman effect.</p> <p><b>CO 5:</b> Understand many electron systems: Spin orbit coupling, Vector atom model, LS and JJ coupling.</p>
C-12 Solid State Physics	<p><b>CO 1:</b> Understand basic crystal structure and compare various crystal systems.</p> <p><b>CO 2:</b> Learn X-ray diffraction and various methods to obtain diffraction pattern. Understand Bragg's law.</p> <p><b>CO 3:</b> Revive the knowledge of magnetic properties of solids.</p> <p><b>CO 4:</b> Understand basic properties of semiconductors and band structure of solids</p> <p><b>CO 5:</b> Acquire knowledge about superconductivity.</p>
DSE-1 Classical Dynamics	<p><b>CO 1:</b> Revive the knowledge of Lagrangian and Hamiltonian mechanics</p> <p><b>CO 2:</b> To review the fundamental concepts of relativity and to create an understanding of their applications</p> <p><b>CO 3:</b> Learn details about small oscillations.</p> <p><b>CO 4:</b> Understand fluid dynamics with practical applications.</p>
DSE-2 Nuclear and Particle Physics	<p><b>CO 1:</b> Understand general intrinsic properties of Nuclei: binding energy and its relation with mass number. Learning of different nuclear models and discussion on nuclear stabilities.</p> <p><b>CO 2:</b> Acquire knowledge of basic radioactive decay processes: qualitative discussion on Alpha decay, Neutrino capture and Gamma decay.</p> <p><b>CO 3:</b> Understand of Q-value and reaction cross section of nuclear reactions; interaction of nuclear radiation with matter in the case of photoelectric effect, Compton scattering, pair production.</p> <p><b>CO 4:</b> Learn basic salient features of particle physics: particle interactions, symmetries and conservation laws. Comprehensive description of Quark model.</p>
P-11 Quantum Mechanics and Applications Lab	<p>CO 1: Determine ionizing potential of mercury.</p> <p>CO 2: Observe tunneling effect in tunnel diode using I-V characteristics</p> <p>CO 3: Determine Planck's constant using black body radiation and LEDs</p>
P-12 Solid State Physics Lab	<p><b>CO 1:</b> Learn and measure Coupling Coefficient of a Piezoelectric crystal.</p> <p><b>CO 2:</b> Learn how to draw BH curve for a magnetic material and understand magnetic hysteresis and its practical applications.</p> <p><b>CO 3:</b> Learn how to measure the resistivity of a semiconductor (Ge) with temperature by four-probe method</p>
<b>Semester VI</b>	
<b>Course (Hons)</b>	<b>Outcomes</b>
C-13 Electromagnetic Theory	<p><b>CO 1:</b> Have basic concepts of Electrodynamics and explanation of the mathematical theory of Electromagnetic waves</p> <p><b>CO 2:</b> Learn propagation of EM waves in vacuum, dielectric and conducting medium and their practical applicatins.</p> <p><b>CO 3:</b> Familiarize the polarization of EM wave in more details.</p> <p><b>CO 4:</b> Know details about wave propagation in a waveguide and energy transfer via transmission line.</p>

	<b>CO 5:</b> Understand optical fibre and its applications.
C-14 Statistical Mechanics	<p><b>CO 1:</b> Understand the basic concepts of Statistical mechanics: phase space, ensemble, microstates and macrostates, probability of occurrence, Partition function and evaluation of thermodynamic quantities of physical systems.</p> <p><b>CO 2:</b> Learn classical and quantum theory of radiation: Blackbody radiation, Stefan-Boltzman Law and Wien's displacement law and Planck's quantum postulates.</p> <p><b>CO 3:</b> Realize the emergence of Quantum Statistical Mechanics: Bose-Einstein statistics, Boson gas, BE condensations, Fermi-Dirac statistics, thermodynamics of Fermi gas, White dwarf stars and Chandrasekhar mass limit.</p>
DSE-3 Physics of Earth	<p><b>CO 1:</b> Know the origin and general characteristics of Universe; creation of elements, Solar system, terrestrial and Jovian planets.</p> <p><b>CO 2:</b> Have a general understanding on structure, shape and topography of the exterior and interior of Earth.</p> <p><b>CO 3:</b> Get an overview of dynamical processes occurring in Earth; an introduction to Geophysical method of Earth investigations. Discussion on the atmosphere, climate and biosphere.</p> <p><b>CO 4:</b> Have an understanding on the origin of life on Earth. A special introduction to the geology and geomorphology of Indian subcontinent.</p> <p><b>CO 5:</b> Learn about the future of evolution of the Earth and solar system: Death of the Earth and contemporary dilemmas.</p>
DSE-4 Communication Electronics	<p><b>CO 1:</b> Learn basics of communication and spectral distribution of different communication modes.</p> <p><b>CO 2:</b> Understand modulation techniques (both analog and digital) and their applications.</p> <p><b>CO 3:</b> Familiarize satellite communication.</p> <p><b>CO 4:</b> Learn mobile communication and its importance.</p>
P-13 Electromagnetic Theory Lab	<p><b>CO 1:</b> Learn to use Polarimeter, Babinet's compensator, Spectrometer.</p> <p><b>CO 2:</b> Visualize specific rotation of sugar solution using Polarimeter</p> <p><b>CO 3:</b> Determine the wavelength and velocity of ultrasonic waves in a liquid</p>
P-14 Statistical Mechanics Lab	<p><b>CO 1:</b> Learn computational techniques to numerically solve equation of states and estimation of thermodynamic functions of a system of particles.</p> <p><b>CO 2:</b> Have ideas and working experience of Monte-Carlo methods and Ising model.</p>
<b>SEC- Skill Enhancement Course                      DSE - Department Specific Electives</b>	

## Course Outcomes (CO) for Physics Programme and GE

*(Upon completion of these courses the student would be able to....)*

### Semester I

Course (GE/ Programme)	Outcomes
GE-I/C-1A Physics-I (Mechanics, Electrostatics and Sound)	<p><b>CO 1:</b> Revive the knowledge of Newton's laws of motion, the concepts of linear and angular momentum and torque.</p> <p><b>CO 2:</b> Understand the principle of work, energy and power. Determine the Centre mass of a given configuration. Understand and determine angular momentum of a body about any given axis</p> <p><b>CO 3:</b> Acquire knowledge about the Postulates of special theory of relativity, Lorentz transformation, time dilation and relativistic addition of velocities.</p> <p><b>CO 4:</b> Learn Electrostatics basics. Understand the relation between electrical charge, electrical field, electrical potential and capacitance of an isolated spherical conductor, displacement vector and parallel plate capacitor filled with dielectric.</p> <p><b>CO 5:</b> Understand and realize the superposition of SHM, Beats, Lissajous Figure, Forced Vibration, resonance, musical scale and Sabine's formula.</p>
Physics-I Lab (Mechanics and Sound Lab)	<p><b>CO 1:</b> Learn how to use screw gauge, slide callipers, microscope, telescope, Cathode Ray oscilloscope.</p> <p><b>CO 2:</b> Know how to measure Young's modulus, coefficient of Viscosity, acceleration due to gravity, spring constant. Measure elastic constants of a wire by Searle's Method.</p> <p><b>CO 3:</b> Learn how to measure moment of inertia of an object about an axis of rotation.</p> <p><b>CO 4:</b> Experimentally determine Frequency <math>f</math> vs <math>1/l</math> curve for a sonometer- wire and hence unknown frequency of a tuning fork.</p> <p><b>CO 5:</b> Visualize Lissajous Figures with a CRO.</p>
Semester II	
Course (GE/ Programme)	Outcomes
GE-II/C-1B Physics-II (Electromagnetism and Thermal Physics)	<p><b>CO 1:</b> Learn basics of electromagnetism. Acquire knowledge about Biot-Savart's law, magnetic vector potential, Ampere's circuital law, Faraday's laws of electromagnetic induction and Lenz's law.</p> <p><b>CO 2:</b> Familiarize with Maxwell's equations and wave propagations</p> <p><b>CO 3:</b> Understand kinetic theory of gases, Black body radiation, Stefan Boltzmann Law, Wien's displacement law</p> <p><b>CO 4:</b> Develop knowledge base of thermodynamics with special emphasis on reversible-irreversible process and Carnot's engine.</p> <p><b>CO 5:</b> Learn basics of statistical mechanics.</p>
Physics-II Lab (Electromagnetism and Thermal Physics Lab)	<p><b>CO 1:</b> Learn to measure resistance, current, voltage, capacitance with multimeter.</p> <p><b>CO 2:</b> Determine Plank's constant, Stefan's constant, coefficient of thermal conductivity with different practical approximations during measurement.</p>

	<p><b>CO 3:</b> Design circuit and verify the Thevenin and Norton theorems.</p> <p><b>CO 4:</b> Learn to use Galvanometer, meter bridge.</p> <p><b>CO 5:</b> Visualize and measure thermal expansion using optical lever.</p>
<b>Semester III</b>	
<b>Course (GE/ Programme)</b>	<b>Outcomes</b>
<p>GE-III/C-1C Physics-III (Physical Optics and Modern Physics)</p>	<p><b>CO 1:</b> Learn Wave optics and detail analysis of Interference and diffraction process and their applications in real world</p> <p><b>CO 2:</b> Learn transverse nature of light as ingredient for polarization of light</p> <p><b>CO 3:</b> Understand basic crystal structure and compare various crystal systems.</p> <p><b>CO 4:</b> Learn X-ray diffraction and various methods to obtain diffraction pattern. Understand Bragg's law.</p> <p><b>CO 5:</b> Develop concept about Heisenberg uncertainty principle. Learn basics of quantum mechanics, understand wave-particle duality, probability function density.</p> <p><b>CO 6:</b> Realize the constituents and properties of atomic nucleus.</p> <p><b>CO 7:</b> Learn radioactivity and its consequences.</p>
<p>SEC-1 Renewable Energy and Energy Harvesting</p>	<p><b>CO 1:</b> Understand the need of alternate renewable energy sources in place of conventional fossil fuels.</p> <p><b>CO 2:</b> Knowledge of huge potentials of solar energy source and different mode of applications of solar power.</p> <p><b>CO 3:</b> Acquire knowledge about different clean energy sources like tidal energy, wind energy, geothermal energy.</p> <p><b>CO 4:</b> Working principles and specific applications of piezoelectricity and electromagnetic energy.</p>
<p>Physics-III Lab</p>	<p><b>CO 1:</b> Learn how to level and focus a spectrometer</p> <p><b>CO 2:</b> Determine the Resolving Power of a Prism, dispersive power of the material of a Prism using Mercury Light</p> <p><b>CO 3:</b> Measure Boltzmann constant using V-I characteristic of PN diode.</p> <p><b>CO 4:</b> Determine Planck's constant using LEDs of different colours</p> <p><b>CO 5:</b> Learn how to use travelling microscope and using the same determine refractive index of water.</p> <p><b>CO 6:</b> Measure focal length of a convex lens and refractive index of the material of a lens by lens-mirror method.</p>
<b>Semester IV</b>	
<b>Course (GE/ Programme)</b>	<b>Outcomes</b>
<p>GE-IV/C-1D Physics-IV (Electronics and instrumentation)</p>	<p><b>CO 1:</b> Learn basic properties of semiconductors and band structure of solids.</p> <p><b>CO 2:</b> Understand p and n type semiconductors, construction of p-n junction and current flow mechanism in a p-n junction diode.</p> <p><b>CO 3:</b> Learn about BJT, FET, MOSFET and their applications specifically in amplifier circuit. Understand the feedback circuits, oscillators and power amplifiers</p> <p><b>CO 4:</b> Understand difference between Analog and Digital Circuits and different active and passive components in a circuit.</p>

	<p><b>CO 5:</b> Familiarize with different number systems, conversions and binary arithmetic operations. Learn Boolean algebra and conversion of a Truth table into Equivalent Logic Circuit.</p> <p><b>CO 6:</b> Understand OPAMP basics and different OPAMP circuits</p> <p><b>CO 7:</b> Know basics of power supply, rectifier circuit and voltage regulations</p>
SEC-2 Radiation Safety	<p><b>CO 1:</b> Learn about the basic concept of atomic structure, composition of nucleus, mass energy, isotopes.</p> <p><b>CO 2:</b> Understanding Radioactivity and different types of decay.</p> <p><b>CO 3:</b> Different radiation detectors and their working principle.</p> <p><b>CO 4:</b> Acquire knowledge about International Commission on Radiological Protection (ICRP) principles</p> <p><b>CO 5:</b> Learn different applications of nuclear techniques for the betterment of life.</p>
Physics-IV Lab (Electronics Lab)	<p><b>CO 1:</b> Design and study characteristics of a transistor amplifier circuit using transistor and other discrete circuit components.</p> <p><b>CO 2:</b> Acquire knowledge about design and study A/D converter, inverting-noninverting amplifier using OPAMPs.</p> <p><b>CO 3:</b> Design and verify different logic gates using ICs</p> <p><b>CO 4:</b> Measure and draw the I-V characteristics of resistance and P-N junction diode and determine d.c. and a.c. resistance of both the elements</p>
<b>Semester V</b>	
<b>Course (Programme)</b>	<b>Outcomes</b>
DSE-1A (Classical Dynamics)	<p><b>CO 1:</b> Revive the knowledge of Lagrangian and Hamiltonian mechanics</p> <p><b>CO 2:</b> To review the fundamental concepts of relativity and to create an understanding of their applications</p> <p><b>CO 3:</b> Learn details about small oscillations.</p> <p><b>CO 4:</b> Understand fluid dynamics with practical applications.</p>
SEC-3 Electrical Circuits and Network Skills	<p><b>CO 1:</b> Revive basic knowledge in field of Electricity: Voltage, Current, Resistance, and Power. Familiarize with resistors, inductors, capacitors, Diode and rectifiers</p> <p><b>CO 2:</b> Understand different electrical circuits component wise as well as according to their working with focus on saving energy and money</p> <p><b>CO 3:</b> Learn electrical drawing and symbols of different components.</p> <p><b>CO 4:</b> Develop ideas about construction and working of Generators and Transformers</p> <p><b>CO 5:</b> Know basics of electrical wiring, electrical protection and corresponding circuit elements.</p>
<b>Semester VI</b>	
<b>Course (Programme)</b>	<b>Outcomes</b>
DSE-1B (Physics of Earth)	<p><b>CO 1:</b> Know the origin and general characteristics of Universe; creation of elements, Solar system, terrestrial and Jovian planets.</p> <p><b>CO 2:</b> Have a general understanding on structure, shape and topography of the exterior and interior of Earth.</p>

	<p><b>CO 3:</b> Get an overview of dynamical processes occurring in Earth; an introduction to Geophysical method of Earth investigations. Discussion on the atmosphere, climate and biosphere.</p> <p><b>CO 4:</b> Have an understanding on the origin of life on Earth. A special introduction to the geology and geomorphology of Indian subcontinent.</p> <p><b>CO 5:</b> Learn about the future of evolution of the Earth and solar system: Death of the Earth and contemporary dilemmas.</p>
<p>SEC-4 Basic Instrumentation Skills</p>	<p><b>CO 1:</b> Know important parameters of electrical measurements like: accuracy, precision, sensitivity, resolution, range</p> <p><b>CO 2:</b> Have an insight of Electronic Voltmeter (Construction, working principle and classifications)</p> <p><b>CO 3:</b> Understand working principle components and applications of cathode ray oscilloscope (CRO)</p> <p><b>CO 4:</b> Learn working and applications of different signal generators</p> <p><b>CO 5:</b> Learn Impedance Bridges &amp; Q-Meters</p> <p><b>CO 6:</b> Develop ideas regarding different digital meters with special emphasis on digital multimeter.</p>