DEPARTMENT OF PHYSICS

B.Sc. Physics (Model 1)

Core - Theory

SEMESTER 1

PH1CRT01	Methodology and Perspectives of Physics	Credits: 2
CO1	Understand the evolution of Physics in past century, recall the contributions of various physicists all over the world	
CO2	Understand various number systems and illustrate their significance	
CO3	Apply vector calculus to physical problem solving	
CO4	Develop the basic idea of scientific experimentation and estimation of errors in measurements	
CO5	Decide on the coordinate system to be used for solving practical problems	

SEMESTER 2

PH2CRT02	Mechanics and Properties of Matter	Credits: 2
CO1	Understand the basic concepts of wave motion, rotational dynamics and hydrodynamics	
CO2	Demonstrate basic experiments on rotational motion	
CO3	Define elasticity and moduli of elasticity	
CO4	Illustrate experiments of surface tension and viscosity	
CO5	Solve numerical problems on wave mechanics, elasticity, hydrodynamics	

SEMESTER 3

PH3CRT03	Optics, Laser and Fiber Optics	Credits: 3
CO1	Understand the properties of light such as diffraction, interference, and polarization	
CO2	Construct experiments to study the properties of light	
CO3	Define the mechanism of working of lasers and optic fibers	
CO4	Compare the diffraction patterns obtained from single slit, double slit, newton's rings, air wedge	

SEMESTER 4

PH4CRT04	Semiconductor Physics	Credits: 3
CO1	Understand the underlying concepts of semiconductors and construction and characteristics of p-n junctions.	
CO2	Understand the basic mechanism of transistors, various configurations and input/output characteristics	
CO3	Construct amplifiers & oscillators	
CO4	Explain Field Effect Transistor (FET) and Op-Amp	
CO5	Design minor circuits using Op-Amp	
CO6	Explain the basic idea of modulation and its importance in daily life.	

SEMESTER 5

PH5CRT05	Electricity and Electrodynamics	Credits: 3
CO1	Understand the concepts of transient current and thermo electricity	
CO2	Understand the nature of AC circuits containing resistive, inductive and capacitance circuits and compare their performance.	
CO3	Examine the role of different magnetization and the boundary condition of magnetic field.	
CO4	Illustrate Faraday's law of induction, Maxwell's equations in different media and displacement current.	
CO5	Solve problems on network theorem	

PH5CRT06	Classical and Quantum Mechanics	Credits: 3
CO1	Understand the Lagrangian and Hamiltonian formalisms of analytical mechanics	
CO2	Explain wave properties of particles, De Broglie waves and its implications on the uncertainty principle.	
CO3	Define basic postulates of Quantum Mechanics.	
CO4	Understand the concepts of eigen values and eigen functions	
CO5	Understand the properties of wave function and its probabilistic interpretation	
CO6	Construct Schrodinger's equation to solve basic quantum mechanical problems	

PH5CRT07	Digital Electronics and Programming	Credits: 3
CO1	Explain basic logic gates	
CO2	Compare the truth tables for various logic circuits	
CO3	Simplify circuits and Boolean expressions using the Boolean laws.	
CO4	Design basic combinational and sequential logic circuits.	
CO5	Construct C++ programs to solve physical problems	

PH5CRT08	Environmental Physics and Human Rights	Credits: 4
CO1	Create awareness among the students about the environment and its various problems	
CO2	Classify various renewable, non-renewable and natural energy resources	
CO3	Discuss the rights for women, children, minority in our society	
CO4	Develop the knowledge of solar energy and its applicability in wide range of usage	

CO5	Apply various methods for waste management and create environmental healthy methods
CO6	Identify the International, National and State acts prevailing for the protection of human rights

PH5OPT02	**Physics in Daily Life – Open Course**	**Credits: 4**
CO1	Understand fundamental physical quantities and their units	
CO2	Derive the dimensions of various physical quantities	
CO3	Explain significant figures, errors.	
CO4	Understand the role of light and em waves in daily life.	
CO5	Explain Total internal reflection, mirage, sparkling of diamond concave and convex mirrors Human eye, defects of the eye	
CO6	Calculate energy requirements for daily use electric appliances	

SEMESTER 6

PH6CRT09	**Thermal and Statistical Physics**	**Credits: 3**
CO1	Explain real gas behavior based on Andrew's experiment	
CO2	Derive the modified expression for equation of state of real gas	
CO3	Apply the laws of thermodynamics to the working of heat engines.	
CO4	Define ensembles and partition functions in statistical mechanics	
CO5	deduce Maxwell Boltzmann, Fermi-Dirac and Bose-Einstein distribution.	

PH6CRT10	**Relativity And Spectroscopy**	**Credits: 3**
CO1	Understand the concept of frames of references, Galilean and Lorentz Transformation laws.	
CO2	Discuss Zeeman Effect; Nuclear magnetic Resonance (NMR) and Electron spin resonance (ESR)	
CO3	Compare the various molecular energy levels such as electronic, rotational and vibrational energy level	
CO4	Distinguish between Phosphorescence and Fluorescence	
CO5	Understand the basics Raman, IR and Microwave Spectroscopy.	

PH6CRT11	**Nuclear, Particle Physics and Astrophysics**	**Credits: 3**
CO1	Understand the basic concepts about nuclear structure and properties, nuclear forces and radioactivity	
CO2	Differentiate between the different nuclear reactions and decay processes.	
CO3	Discuss different nuclear models and their limitations	

CO4	Describe the origin and properties of cosmic radiation and its influence on Earth's atmosphere
CO5	Understand elementary particles, quantum numbers and quark model.
CO6	Explain the origin, evolution and classification of stars and their properties

PH6CRT12	**Solid State Physics**	**Credits: 3**
CO1	Understand crystal structures and X-ray diffraction methods to analyze crystal structures	
CO2	Derive the packing fraction for various crystal structures	
CO3	Understand free electron theory and elementary band theory	
CO4	Explain the dielectric and magnetic properties of materials	
CO5	Derive Bloch theorem, Kronig-Penney model	
CO6	Discuss the concepts and applications of superconductors	

PH6CBT03	**Computational Physics - Elective**	**Credits: 3**
CO1	Illustrate the pinout diagram and architecture of microprocessor	
CO2	Develop simple programs for data transfer, addition and subtraction in microprocessor	
CO3	Apply C++ programming for matrix multiplication, number conversion etc.	
CO4	Solve numerical integration problems using trapezoidal, Simpson's, euler's and Runge - Kutta method	

Core – Practical

Semester 1 & 2

PH2CRP01	Mechanics and Properties of Matter	Credits: 2
CO1	Evaluate the acceleration due to gravity, moment of inertia, radius of gyration using pendulums	
CO2	Determine the rigidity modulus of materials using experiments like static torsion, torsion pendulum etc.	
CO3	Demonstrate experimental procedures for the determination of viscosity and surface tension of liquids	
CO4	Determine the elasticity of materials using experiments like uniform and non-uniform beam bending, cantilever etc.	

Semester 3 & 4

PH2CRP02	Optics and Semiconductor Physics	Credits: 2
CO1	Determine the refractive index of prism using spectrometer	
CO2	Analyze the interference pattern produced by newton's rings and wedge - shaped film	
CO3	Experimentally obtain the ripple factor of rectifiers	
CO4	Design Op-Amp circuits to amplify a given signal	

Semester 5 & 6

PH6CRP03	Electricity, Magnetism and LASER	Credits: 2
CO1	Calibrate a given voltmeter/ammeter using Potentiometer	
CO2	Apply Thevenin's and Norton's theorems, Superposition and Maximum power transfer theorems in linear circuits	
CO3	Calculate the magnetic moment and earth's horizontal magnetic field using magnetometers	
CO4	Determine the wavelength of lasers using diffraction grating and single slit	

PH5CRT04	Digital Electronics	Credits: 2
CO1	Construct basic gates from universal gates	
CO2	Verify the truth table for adder circuits	
CO3	Design D/A and A/D convertors	
CO4	Construct Schmidt trigger and obtain the waveform	
CO5	Develop BCD to 7 segment decoder	

PH5CRT05	Thermal physics, spectroscopy and C++ programming	Credits: 2
CO1	Interpret thermal properties of conductors and insulators using thermal experiments	
CO2	Apply the logic of C++ programming to solve problems	
CO3	Deduce the resolving power and dispersive power of prism/grating using spectrometer	
CO4	Calculate the optical constants of a medium using spectrometer	

PH5CRT06	Acoustics, Photonics and Semiconductor Physics	Credits: 2
CO1	Apply the idea of standing waves to determine the frequency of tuning fork	
CO2	Compare the refractive indices of ordinary and extra – ordinary rays using quartz prism	
CO3	Plot the characteristic curves for solar cell, LDR, LED	
CO4	Design regulated power supply using transistors, Zener diodes and IC	
CO5	Construct adder/subtractors, voltage multipliers and wave shaping circuits	

Complementary – Theory

PH1CMT01	Properties of Matter and Error Analysis	Credits: 2
CO1	Understand the concepts of elasticity and modulus of elasticity	
CO2	Explain the hydrodynamic properties of fluids	
CO3	Estimate the errors in various physical measurements	

PH1CMT02	Properties of Matter and Thermodynamics	Credits: 2
CO1	Understand the concepts of elasticity and modulus of elasticity	
CO2	Explain the hydrodynamic properties of fluids	
CO3	Explain the various laws of thermodynamics	

PH2CMT01	Mechanics & Astrophysics	Credits: 2
CO1	Explain velocity, acceleration, force, acceleration due to gravity, centripetal acceleration and centrifugal force	

CO2	Determine the theoretical and practical moment of inertia of different bodies.
CO3	Understand Periodic, oscillatory motion and energy of a particle executing simple harmonic motion, damped oscillation, forced oscillation and resonance
CO4	Categorize stars based on their temperature
CO5	Apply parallel and perpendicular axis theorem to solve problems

PH2CMT02	**Mechanics & Superconductivity**	**Credits: 2**
CO1	Explain velocity, acceleration, force, acceleration due to gravity, centripetal acceleration and centrifugal force	
CO2	Analyze different types of harmonic motions.	
CO3	Determine moment of inertia of different bodies of various shapes	
CO4	Understand Periodic, oscillatory motion and energy of a particle executing simple harmonic motion, damped oscillation, forced oscillation and resonance	

PH3CMT01	**Modern Physics and Electronics**	**Credits: 3**
CO1	Understand types of atom models & related principles, atomic nucleus and its fundamental properties	
CO2	Explain the fundamentals of quantum mechanics	
CO3	Describe the basic principles of spectroscopy	
CO4	Distinguish different types of semiconducting diodes and bipolar junction transistor.	
CO5	Understand the fundamentals of digital electronics	

PH3CMT02	**Modern Physics & Magnetism**	**Credits: 3**
CO1	Understand types of atom models & related principles, atomic nucleus and its fundamental properties	
CO2	Explain the fundamentals of quantum mechanics	
CO3	Describe the basic principles of spectroscopy	
CO4	Distinguish different types of semiconducting diodes and bipolar junction transistor.	
CO5	Differentiate magnetic materials and their properties	

PH4CMT01	**Optics and Electricity**	**Credits: 3**
CO1	Apply the concepts of interference, diffraction and polarization in different practical cases	

CO2	Understand the principle of laser and fiber optics
CO3	Differentiate the polar electrics and non-polar dielectrics.
CO4	Understand the characteristics and types of laser
CO5	Apply the concepts of alternating current to solve problems

PH4CMT02	**Optics and Solid State Physics**	**Credits: 3**
CO1	Apply the concepts of interference, diffraction and polarization in different practical cases	
CO2	Understand the principle of laser and fiber optics	
CO3	Differentiate the polar electrics and non-polar dielectrics.	
CO4	Understand the characteristics and types of laser	
CO5	Understand Crystal structure-crystal lattice, X Ray diffraction techniques	

Complementary - Practical

PH2CMP01	**Complementary Physics Practical**	**Credits: 2**
CO1	Determine the volume and area of various shapes using vernier calipers and screw gauge	
CO2	Determine the refractive Index of material of prism using Spectrometer	
CO3	Calculate the coefficient of viscosity of the liquid using constant and variable pressure head method	
CO4	Plot the diode characteristics	
CO5	Calculate the Moment of Inertia of the fly wheel and rigidity modulus of the torsion pendulum.	
CO6	Calculate the Young's Modulus of cantilever using scale and telescope	

PH4CMP02	**Complementary Physics Practical**	**Credits: 2**
CO1	Distinguish between young's modulus and rigidity modulus	
CO2	Determine the dispersive power of prism and grating using spectrometer	
CO3	Construct half wave/full wave rectifier	
CO4	Determine the magnetic moment of a magnet	
CO5	Verify the truth tables of basic logic gates	