B.Sc. (Honours) with Physics		
Program Specific Outcomes (PSO): • The students would gain substantial knowledge in various branches of physics: Electronics, Quantum, classical, statistical mechanics, condensed matter physics, astrophysics, particle, nuclear and high energy Physics. • Also students learn about various application based topic such as Workshop skill, Weather forecasting, Radiation Hazards etc. • Students can understand basic mechanics and properties of matter. • Students can illustrate the principles of electricity, magnetism, thermodynamics, optics and spectroscopy. • Students can identify, formulate and analyze complex problems using basic principles of mathematics, physics and statistics. • Students can design, construct and analyze basic electronic and digital circuits. • Students can understand the basics of programming language and apply it to various numerical problems. • Students can develop effective communication skills.		
Class/Paper/ Semester	Title	Course Outcome (CO)
Physics UG (CBCS) Semester-I		
PHY-H-CC-T-01 Semester I	MATHEMATICAL PHYSICS-I	After completion of this course student should be able to learn: • Second Order Differential equations: Homogeneous Equations with constant coefficients. Wronskian and general solution. Statement of existence and Uniqueness Theorem for Initial Value Problems. Particular Integral. • Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor. Constrained Maximization using Lagrange Multipliers. • Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. • Vector Differentiation: Vector identities, Gradient, divergence, curl and Laplacian in spherical and cylindrical coordinates. • Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian Line, surface and volume integrals of Vector fields. • Orthogonal Curvilinear Coordinates of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems. • Matrices: Addition and Multiplication of Matrices. Null Matrices. Diagonal, Scalar and Unit Matrices. Transpose of a Matrix. Symmetric and Skew-Symmetric Matrices. Cayley-Hamiliton Theorem. Diagonalization of Matrices. Solutions of Coupled Linear Ordinary homogeneous Differential Equations. Functions of a Matrix. • Introduction to probability: Independent random variables: Sample space and Probability distribution functions. Binomial, Gaussian, and Poisson distribution. • Dirac Delta function and its properties

PHY-H-CC-P-01 Semester I	MATHEMATICAL PHYSICS-I	After completion of this course student should be able to learn: • Computer architecture and organization, memory and Input/output devices • Basics of scientific computing • Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, Iterative methods • Errors and error Analysis • Truncation and round off errors, Absolute and relative errors, Floating point computations. • Introduction to programming in Python/Fortran/Matlab/C/C++: • Introduction to programming, constants, variables and data types, dynamical typing, operators and expressions, modules, I/O statements, iterables, compound statements, indentation in python. • To plotting graphs with Matplotlib/Gnuplot/Origin/Excel • Basic 2D and 3D graph plotting - plotting functions and datafiles, fitting data using gnuplot's fit function, polar and parametric plots, modifying the appearance of graphs, Surface and contour plots, exporting plots • Find Solution of Algebraic and Transcendental equations by Bisection, Newton Raphson and Secant method • Interpolation by Newton Gregory Forward and Backward difference formula, Error estimation of linear interpolation • Numerical differentiation (Forward and Backward difference formula) and Integration (Trapezoidal and Simpson rules), Monte Carlo method • Curve fitting, Least square fit, Goodness of fit, standard deviation
PHY-H-CC-T-02 Semester I	MECHANICS	After completion of this course student should be able to learn: • Fundamentals of Dynamics: Reference frames. Inertial frames; Galilean transformations; Galilean invariance. Motion of rocket. • Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium.. • Collisions: Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames. • Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. • Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire • Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube. Euler’s Equation. Bernoulli’s Theorem. • Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere. • Motion of a particle under a central force field: Two-body problem and its reductiontoone-body problem and its solution. The energy equation and energy diagram. Kepler'sLaws. Satellite in circular orbit and applications. Geosynchronous orbits. • Damped oscillation. Forced oscillations: Transient and steady states; Resonance,sharpness of resonance; power dissipation and Quality Factor. • Coriolisforce and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems.

		• Special Theory of Relativity: Michelson-Morley Experiment and its outcome.Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity andorder of events. Lorentz contraction. Time dilation.
PHY-H-CC-P-02 Semester I	MECHANICS	After going through the course, the students should be able • To Measure of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To study the random error in observations. • To determine the height of a building using a Sextant. • To determine the Moment of Inertia of a rigid body. • To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method). • To determine the Young's Modulus of the material of a bar by flexure method • To determine the value of g using Bar Pendulum. • To determine the value of g using Kater's Pendulum.
PHY-H-CC-T-03 Semester II	ELECTRICITY ANDMAGNETISM	After completion of this course student should be able to learn: • Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. • Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application • Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant. • Magnetic force between current elements and definition of Magnetic FieldB. Biot-Savart's Law and its simple applications: straight wire and circular loop. Ampere's Circuital Law • Magnetic Properties of Matter • Electromagnetic Induction
PHY-H-CC-P-03 Semester II	ELECTRICITY ANDMAGNETISM	After going through the course, the students should be able • To study the characteristics of a series(a) RC Circuit. • To determine an unknown Low Resistance using Potentiometer. • To determine an unknown Low Resistance using Carey Foster's Bridge. • To compare capacitances using De' Sauty's bridge. • To verify the Thevenin and Norton theorems. • To verify the Superposition, and Maximum power transfer theorems.

PHY-H-CC-T-04 Semester II	WAVES AND OPTICS	After completion of this course student should be able to learn: • Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. • Velocity of Transverse Vibrations of Stretched Strings. Newton's Formula forVelocity of Sound. Laplace's Correction • Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment.Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings • Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence. • Interference, Interferometer • Diffraction
PHY-H-CC-P-04 Semester II	WAVES AND OPTICS	After going through the course, the students should be able • To determine wavelength of (1) Na source and (2) spectral lines ofHg source using plane diffraction grating. • To determine dispersive power and resolving power of a plane diffraction grating. • To draw the deviation - wavelength of the material of a prism and to find the wavelength of an unknown line from its deviation.
PHY-H-CC-T-05 Semester III	MATHEMATICAL PHYSICS-II	After completion of this course student should be able to learn: • Fourier Series • Frobenius Method and Special Functions • Some Special Integrals • Theory of Errors • Partial Differential Equations
PHY-H-CC-P-05 Semester III	MATHEMATICAL PHYSICS-II	After going through the course, the students should be able to Solve the following Ordinary Differential Equations (ODE) (1^{st} and 2^{nd} order Differential equation) by Euler, modified Euler and Runge-Kutta (RK) 2^{nd} and 4^{th} order methods • Radioactive decay • Current in LCR, RC, LC circuits with DC source and AC source. • Newton's law of cooling • Classical equations of motion (1^{st} and 2^{nd} order Differential Equations) • Simple harmonic oscillator • Damped, overdamped, critically damped harmonic oscillator. • Undamped and damped forced harmonic oscillator • Transient and Steady state solution of a forced harmonic oscillator

PHY-H-CC-T-06 Semester III	THERMAL PHYSICS	After completion of this course student should be able to learn: • Zeroth and First Law of Thermodynamics • Second Law of Thermodynamics • Entropy • Thermodynamic Potentials • Maxwell's Thermodynamic Relations • Kinetic Theory of GasesDistribution of Velocities • Molecular Collisions • Real Gases
PHY-H-CC-P-06 Semester III	THERMAL PHYSICS	After going through the course, the students should be able • To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. • To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer • To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions
PHY-H-CC-T-07 Semester III	ANALOG SYSTEMS AND APPLICATIONS	After completion of this course student should be able to learn: • P and N type semiconductors. Energy Level Diagram. • Conductivity and Mobility, Concept of Drift velocity. PN Junction Fabrication • Rectifier Diode: Halfwave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor • n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β • Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network • Coupled Amplifier • Feedback in Amplifiers • Sinusoidal Oscillators • Operational Amplifiers (Black Box approach • Applications of Op-Amps • Resistive network (Weighted and R-2R Ladder). Accuracy and Resolution. A/D Conversion (successive approximation)
PHY-H-CC-P-07 Semester III	ANALOG SYSTEMS AND APPLICATIONS	• After going through the course, the students should be able • To study V-I characteristics of PN junction diode, and / Light emitting diode. • To study the V-I characteristics of a Zener diode and its use as voltage regulator. • Study of V-I & power curves of solar cells, and find maximum power point & efficiency. • To study the characteristics of a Bipolar Junction Transistor in CE configuration. • To study the various biasing configurations of BJT for normal class A operation. • To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias. • To study the frequency response of voltage gain of a RC-coupled transistor amplifier.
PHY-H-CC-T-08 Semester IV	MATHEMATICAL PHYSICS-III	After completion of this course student should be able to learn: • Brief Revision of Complex Numbers and their Graphical Representation. Euler's formula, De Moivre's theorem, Roots of Complex Numbers. Functions of Complex Variables. Analyticity and Cauchy-Riemann Conditions. Examples of analytic functions. Singular functions: poles and branch points, order of

		singularity • Fourier Transforms: Fourier Integral theorem • Laplace Transform (LT) of Elementary functions. Properties of LTs: Change of Scale Theorem, Shifting Theorem

PHY-H-CC-P-08 Semester IV	MATHEMATICAL PHYSICS-III	After going through the course, the students should be able to find the Numerical computation using Python: • Write a program to calculate the sum $\sum_{n=1}^{\infty} 0.2^n$ • Evaluate the Fourier coefficients of a given periodic function (square wave). • Frobenius method and special functions: Verify the relation $\int_{-1}^{1} P_n(\mu)P_m(\mu) = \delta_{n,m}$. Plot $P_n(x)$, $J_n(x)$. • Calculation of error for each data point of observations recorded in experiments done in previous semesters (choose any two). • Calculation of least square fitting manually without giving weightage to error. Confirmation of least square fitting of data through computer program.
PHY-H-CC-T-09 Semester IV	ELEMENTS OF MODERN PHYSICS	After completion of this course student should be able to learn: • Planck's quantum hypothesis, Planck's constant and light as a collection of photons; Blackbody Radiation • Position measurement- gamma ray microscope thought experiment; Waveparticle duality, Heisenberg uncertainty principle • Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence • One dimensional infinitely rigid box- energy eigen values and eigen functions, normalization; Quantum dot as example • Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle • Stability of the nucleus; Law of radioactive decay; Mean life and half-life; Alpha decay; Beta decay- energy released, • Fission and fusion- mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons • Lasers: Einstein's A and B coefficients. Metastable states. Spontaneous and Stimulated emissions. Optical Pumping and Population Inversion
PHY-H-CC-P-09 Semester IV	ELEMENTS OF MODERN PHYSICS	After going through the course, the students should be able • To determine the Planck's constant using LEDs of at least 4 different colours. • To determine the slit width (a) using diffraction of single slit. • To determine the slit width (a,b) using diffraction of double slits. • To determine (1) wavelength and of He-Ne light /laser using plane diffraction grating
PHY-H-CC-T-10 Semester IV	DIGITAL SYSTEMS ANDAPPLICATIONS	After completion of this course student should be able to learn: • Introduction to CRO • Integrated Circuits • Digital Circuits • Boolean algebra • Data processing circuits • Arithmetic Circuits: Binary Addition. Binary Subtraction using 2's Complement. Half and Full Adders. Half & Full Subtractors, 4-bit binary Adder/Subtractor • Sequential Circuits: SR, D, and JK Flip-Flops. Clocked (Level and Edge Triggered) Flip-Flops. Preset and Clear operations. Race-around conditions in JK Flip-Flop. M/S JK Flip-Flop

		• Timers: IC 555: block diagram and applications • Shift registers: Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers • Ring Counter. Asynchronous counters, Decade Counter • Intel 8085 Microprocessor Architecture: Main features of 8085. Block diagram. Components. Pin-out diagram, Buses

PHY-H-CC-P-10 Semester IV	DIGITAL SYSTEMS ANDAPPLICATIONS	After going through the course, the students should be able • To measure (a) Voltage, and (b) Time period of a periodic waveform using CRO. • To test a Diode and Transistor using a Multimeter. • To design a switch (NOT gate) using a transistor. • To verify and design AND, OR, NOT, XOR and using NAND gates. • To design a combinational logic system for a specified Truth Table. • To convert a Boolean expression into logic circuit and design it using logic gate ICs. • To minimize a given logic circuit. • Half Adder, Full Adder and 4-bit binary Adder.
PHY-H-CC-T-11 Semester V	QUANTUM MECHANICS ANDAPPLICATIONS	After completion of this course student should be able to learn: • Time dependent Schrodinger equation • Time independent Schrodinger equation-Hamiltonian • General discussion of bound states in an arbitrary potential • Quantum theory of hydrogen-like atoms • Atoms in Electric & Magnetic Fields • Atoms in External Magnetic Fields • Many electron atoms: Pauli's Exclusion Principle. Symmetric & Anti-symmetric Wave Functions. Periodic table. Fine structure. Spin orbit coupling
PHY-H-CC-P-11 Semester V	QUANTUM MECHANICS ANDAPPLICATIONS	After going through the course, the students should be able to use Python Programming and to 1. Solve the s-wave Schrodinger equation for the ground state and the first excited state of the hydrogen atom: $\frac{d^2y}{dr^2} = \frac{2m}{\hbar^2}(E - V(r))y$ where $V(r) = -\frac{e^2}{r}$ 2. Solve the s-wave radial Schrodinger equation for an atom $\frac{d^2y}{dr^2} = \frac{2m}{\hbar^2}(E - V(r))y$, where $V(r) = -\frac{e^2}{r}e^{-r/a}$ 3. Solve the s-wave radial Schrodinger equation for an atom $$\frac{d^2y}{dr^2} = \frac{2m}{\hbar^2}(E - V(r))y$$ where $V(r) = -\frac{e^2}{r}$
PHY-H-CC-T-12 Semester V	STATISTICAL MECHANICS	After completion of this course student should be able to learn: • Classical Statistics: Macro state & Microstate, Elementary Concept of Ensemble, Phase Space, Entropy and Thermodynamic Probability • Classical Theory of Radiation: Properties of Thermal Radiation • Quantum Theory of Radiation: Spectral Distribution of Black Body Radiation • Bose-Einstein Statistics: B-E distribution law, Thermodynamic functions of a strongly Degenerate Bose Gas • Fermi-Dirac Statistics: Fermi-Dirac Distribution Law
PHY-H-CC-P-12	STATISTICAL MECHANICS	After going through the course, the students should be able to • Plot Planck's law for Black Body radiation and compare it with Wein's Law and Raleigh-Jeans Law at high temperature (room temperature) and low temperature.

Semester V		• Plot Specific Heat of Solids by comparing (a) Dulong-Petit law, (b) Einstein distribution function, (c) Debye distribution function for high temperature (room temperature) and low temperature and compare them for these two cases • Plot Maxwell-Boltzmann distribution function versus temperature. • Plot Fermi-Dirac distribution function versus temperature. • Plot Bose-Einstein distribution function versus temperature.
PHY-H-CC-T-13 Semester VI	ELECTROMAGNETIC THEORY	After completion of this course student should be able to learn: • Maxwell Equations: Displacement Current. Vector and Scalar Potentials. Gauge Transformations: Lorentz and Coulomb Gauge. • Plane EM waves through vacuum and isotropic dielectric medium, transverse nature of plane EM waves, refractive index and dielectric constant, wave impedance. • Boundary conditions at a plane interface between two media. Reflection & Refraction of plane waves at plane interface between two dielectric media-Laws of Reflection & Refraction. • Description of Linear, Circular and Elliptical Polarization. Propagation of E.M. Waves in Anisotropic Media. Symmetric Nature of Dielectric Tensor. Fresnel's Formula. Uniaxial and Biaxial Crystals. • Optical Rotation. Biot's Laws for Rotatory Polarization. Fresnel's Theory of optical rotation. Calculation of angle of rotation • Planar optical wave guides. Planar dielectric wave guide. Condition of continuity at interface. Phase shift on total reflection • Numerical Aperture. Step and Graded Indices (Definitions Only).Single and Multiple Mode Fibres
PHY-H-CC-P-13 Semester VI	ELECTROMAGNETIC THEORY	After going through the course, the students should be able • To determine the specific rotation of sugar solution using Polarimeter. • To determine the Boltzmann constant using V-I characteristics of PN junction diode • To determine the wavelength and velocity of ultrasonic waves in a liquid (Kerosene Oil, Xylene, etc.) by studying the diffraction through ultrasonic grating. • To study the reflection, refraction of microwaves • To study Polarization and double slit interference in microwaves.
PHY-H-CC-T-14 Semester VI	SOLID STATE PHYSICS	After completion of this course student should be able to learn: • Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors • Elementary Lattice Dynamics: Lattice Vibrations and Phonons: Linear Monoatomic and Diatomic Chains. Acoustical and Optical Phonons. Qualitative Description of the Phonon Spectrum in Solids. • Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. Classical Langevin Theory of dia- and Paramagnetic Domains • Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. Depolarization Field. Electric Susceptibility. Polarizability. Clausius Mosotti Equation • Ferroelectric Properties of Materials: Structural phase transition • Elementary band theory: Kronig-Penny model. Band Gap • Superconductivity: Experimental Results. Critical Temperature
PHY-H-CC-	SOLID	After going through the course, the students should be able

P-14 Semester VI	STATE PHYSICS	• To determine the Coupling Coefficient of a Piezoelectric crystal. • To measure the Dielectric Constant of a dielectric Materials with frequency • To determine the complex dielectric constant and plasma frequency of metal using Surface Plasmon resonance (SPR) • To determine the refractive index of a dielectric layer using SPR • To study the PE Hysteresis loop of a Ferroelectric Crystal. • To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis. • To measure the resistivity of a semiconductor (Ge) with temperature by four-probemethod (room temperature to 150 °C) and to determine its band gap.
PHY-H-DSE-T-01 Semester V	CLASSICAL DYNAMICS	After completion of this course student should be able to learn: • Generalized coordinates and velocities. • Hamilton's Principle, Lagrangian and Euler-Lagrange equations. • Geometrical interpretation of Space-time:Minkowski space. The invariant interval, light cone and world lines. • Space-time diagrams. Intervals: space-like, time-like & light-like. Four-velocity and acceleration. • Potentials due to a moving charge: Lienard Wiechert potentials.
PHY-H-DSE-T-02 Semester V	NUCLEAR ANDPARTICLE PHYSICS	After completion of this course student should be able to learn: • General Properties of Nuclei: Constituents of nucleus and their Intrinsic properties, binding energy • Liquid drop model approach, semi empirical mass formula and significance of its various terms, condition of nuclear stability • Radioactivity decay • Nuclear Reactions: Types of Reactions, Conservation Laws, kinematics of reactions, Q-value • Nuclear Astrophysics: Early universe, primordial nucleo-synthesis • Interaction of Nuclear Radiation with matter: Energy loss due to ionization (Bethe-Block formula), energy loss of electrons, Cerenkov radiation • Detector for Nuclear Radiations: Gas detectors: estimation of electric field, mobility of particle, for ionization chamber and GM Counter. Basic principle of Scintillation Detectors • Particle Accelerators: Accelerator facility available in India: Van-de Graaff generator (Tandem accelerator), Linear accelerator, Cyclotron, Synchrotrons. • Particle physics: Particle interactions; basic features, types of particles and its families. Symmetries and Conservation Laws
PHY-H-DSE-T-03 Semester VI	NANO MATERIALS AND APPLICATIONS	After completion of this course student should be able to learn: • Length scales in physics, Nanostructures: 1D, 2D and 3D nanostructures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nanoscale, Size Effects in nano systems • Top down and Bottom up approach, Photolithography. Ball milling. Gas phase condensation • X-Ray Diffraction. Optical Microscopy. Scanning Electron Microscopy. • Coulomb interaction in nanostructures. Concept of dielectric constant for nanostructures and charging of nanostructure. Quasi-particles and excitons. Excitons in direct and indirect band gap semiconductor nanocrystals. • Carrier transport in nanostrcutures. Coulomb blockade effect, thermionic emission, tunneling and hoping conductivity.

		• Applications of nanoparticles, quantum dots, nano wires and thin films for photonic devices (LED, solar cells). Single electron devices (no derivation). CNT based transistors.
B.Sc. Programme (General) Course, Physics		
Program Specific Outcomes (PSO): • The students would gain substantial knowledge in various branches of physics: Electronics, Quantum, classical, statistical mechanics, condensed matter physics, astrophysics, particle, nuclear and high energy Physics. • Also students learn about various application based topic such as Workshop skill, Weather forecasting, Radiation Hazards etc.		
Class/Paper/ Semester	Title	Course Outcome (CO)
PHY-G-CC-T-01 Sem I	MECHANICS	After completion of this course student should be able to learn: • Fundamentals of Dynamics: Reference frames. Inertial frames; Galilean transformations; Galilean invariance. Motion of rocket. • Work and Energy: Work and Kinetic Energy Theorem. Conservative and non-conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium.. • Collisions: Elastic and inelastic collisions between particles. Centre of Mass and Laboratory frames. • Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. • Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire • Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. • Coriolisforce and its applications. Components of Velocity and Acceleration in Cylindrical and Spherical Coordinate Systems. • Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations.
PHY-G-CC-P-01 Sem I	MECHANICS	After going through the course, the students should be able • To Measure of length (or diameter) using vernier caliper, screw gauge and travelling microscope. • To study the random error in observations. • To determine the height of a building using a Sextant. • To determine the Moment of Inertia of a rigid body. • Modulus of the material of a bar by flexure method • To determine the value of g using Bar Pendulum. • To determine the value of g using Kater's Pendulum.
PHY-G-CC-T-02 Sem II	ELECTRICITY AND MAGNETISM AND EM THEORY	After completion of this course student should be able to learn: • Electrostatic Potential. Laplace's and Poisson equations. The Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. • Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Parallel-plate capacitor. • Electric Field in matter. Polarization, Polarization Charges. Electrical Susceptibility and Dielectric Constant.

		• Magnetic force between current elements and definition of Magnetic Field B. • Biot-Savart's Law • Magnetic Properties of Matter • Electromagnetic Induction
PHY-G-CC-P-02 Sem II	ELECTRICITY AND MAGNETISM AND EM THEORY	After going through the course, the students should be able • To study the characteristics of a series RC Circuit. • To determine an unknown Low Resistance using Potentiometer. • To determine an unknown Low Resistance using Carey Foster's Bridge. • To verify the Thevenin and Norton theorems. • To verify the Superposition, and Maximum power transfer theorems.
PHY-G-CC-T-03 Sem III	THERMAL PHYSICS AND STATISTICAL MECHANICS	After completion of this course student should be able to learn: • Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work • Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect • Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion • Blackbody radiation, Spectral distribution, Concept of Energy density, Derivation of Planck's law • Maxwell-Boltzmann law - distribution of velocity – Quantum statistics - Phase space - Fermi-Dirac distribution law
PHY-G-CC-P-03 Sem III	THERMAL PHYSICS AND STATISTICAL MECHANICS	After going through the course, the students should be able • To determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method. • Measurement of Planck's constant using black body radiation. • To determine Stefan's Constant. • To determine the coefficient of thermal conductivity of Cu by Searle's Apparatus. • To determine the Coefficient of Thermal Conductivity of Cu by Angstrom's Method. • To determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method. • To determine the temperature co-efficient of resistance by Platinum resistance thermometer. • To study the variation of thermo e.m.f across two junctions of a thermocouple with temperature.
PHY-G-CC-T-04 Sem IV	WAVES AND OPTICS	After completion of this course student should be able to learn: • Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. • Velocity of Transverse Vibrations of Stretched Strings. Newton's Formula forVelocity of Sound. Laplace's Correction • Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings • Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence. • Interference, Interferometer

		• Diffraction
PHY-G-CC-P-04 Sem IV	WAVES AND OPTICS	After going through the course, the students should be able • To determine wavelength of (1) Na source and (2) spectral lines ofHg source using plane diffraction grating. • To determine dispersive power and resolving power of a plane diffraction grating. • To draw the deviation - wavelength of the material of a prism and to find the wavelength of an unknown line from its deviation.
PHY-G-DSE-T-01 Sem V	DIGITAL, ANALOG CIRCUITS AND INSTRUMENTATION	After completion of this course student should be able to learn: • Difference between Analog and Digital Circuits. Binary Numbers. Decimal to Binary and Binary to Decimal Conversion, AND, OR and NOT Gates • Semiconductor Diodes: P and N type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode. • Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β. • Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop and closed- loop Gain • Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator • Introduction to CRO: Block Diagram of CRO • Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter, • Timer IC: IC 555 Pin diagram and its application as Astable and Monostable Multivibrator.
PHY-G-DSE-P-01 Sem V	DIGITAL, ANALOG CIRCUITS AND INSTRUMENTATION	After going through the course, the students should be able • To measure (a) Voltage, and (b) Frequency of a periodic waveform using CRO • To verify and design AND, OR, NOT and XOR gates using NAND gates. • To minimize a given logic circuit. • Half adder, Full adder and 4-bit Binary Adder. • Adder-Sub tractor using Full Adder I.C. • To design an astable multivibrator of given specifications using 555 Timer. • To design a monostable multivibrator of given specifications using 555 Timer. • To study IV characteristics of PN diode, Zener and Light emitting diode • To study the characteristics of a Transistor in CE configuration. • To design a CE amplifier of given gain (mid-gain) using voltage divider bias. • To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
PHY-G-DSE-T-02 Sem VI	SOLID STATE PHYSICS	After completion of this course student should be able to learn: • Crystal Structure: Solids: Amorphous and Crystalline Materials. Lattice Translation Vectors • Elementary Lattice Dynamics: Lattice Vibrations and Phonons. Qualitative

		Description of the Phonon Spectrum in Solids. • Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials. • Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom. • Ferroelectric Properties of Materials: Structural phase transition • Elementary band theory: Kronig Penny model. Band Gap • Superconductivity: Experimental Results. Critical Temperature
PHY-G-DSE-T-02 Semester VI	SOLID STATE PHYSICS	After going through the course, the students should be able • To determine the Coupling Coefficient of a Piezoelectric crystal. • To measure the Dielectric Constant of a dielectric Materials with frequency • To determine the refractive index of a dielectric layer using SPR • To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis. • To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 °C) and to determine its band gap.