Department of Physics

Programme Outcome	PO-1. To gain students with the basic knowledge in physics and Nano technology, theory and experiment.
	PO-2. To awareness students with the tools needed to analyse problems, apply mathematical formalism and experimentation.
	PO-3 To provide the students with technical skills necessary for successful bright future in physics/Nano-technology. These include mathematics, computers, electronics and devices, and communication skills (oral and written).
	PO4: To introduce the acquired fundamental knowledge of physics, including basic concepts and principles of classical mechanics, electrodynamics, electronics ,quantum mechanics, Statistical Mechanics and thermodynamics & mathematical methods.
	PO5: To show the ability to translate a physical description to a mathematical equation represent key aspects of physics through graphs and diagrams, and problem-solving.
	PO6: To Apply knowledge of concepts of physics, to analyze a variety of physical phenomena.
	PO7: Visualise the laboratory skills, enabling them to take measurements in a physics.
Programme Specific Outcomes	PSO1: understanding awareness of principles, laws and theories of physics.
	PSO2: Apply vector algebra, differential and integral calculus as well as graphical methods to solve physics problems;
	PSO3: To Increase ability to apply knowledge learned in classroom.
	PSO4: To solve physics problems using the appropriate methods in physics.

S.Y.Bsc. Physics	
PHY-231 Mathematical Methods in Physics I	CO1: Understands the basic operations in complex numbers.
	CO2: To explain graphical representation of complex numbers.
	CO3: To solve partial differential equations in Physics.
	CO4: To study the student vector algebra required in Physics.
	CO1: Student defines various laws, theorems and basic terms in electronics.

PHY-232 Electronics	CO2: student can calculate power, voltage or current across or through using circuit theorems and able to design a circuit.
	CO3: To describe construction and working of transistor and its applications.
	CO4: To show DC load line and bias point. List, explain, and design.
	CO5: To present different applications of operational amplifier.
PHY-241 Oscillations, Waves and Sound	CO1: Visualise periodic and oscillatory motion;
	CO2: To solve differential equations of motion for SHM, damped, and forced oscillators.
	CO3: To describe oscillatory motion with graphs and equations, and use to solve problems of oscillatory motion.
	CO4: To discuss phenomenon of resonance and apply in different applications;
PHY-242 Optics	CO1:Students can describe the geometrical formation of images by thin lenses.
	CO2: Use mathematical methods to calculate properties of image, formed by combination of lenses.
	CO3: Student can explain optical aberrations produced in image by lenses and methods.
	CO4: Geometrical determination of polarization of light and concept .
PHY-233 & 243: PRACTICAL COURSE	CO1: Use various instruments like CRO.
	CO2: To design experiments to test a hypothesis determine the value of an unknown quantity.
	CO3: To show the methodology of science and the relationship between observation.
	CO4: Demonstrate experimental instrument to implement an experimental approach.
	CO5: Student can analyse data, plot appropriate graphs.
	CO6: Study in a group to plan, implement and report on a project/experiment.
T.Y. B. Sc. Physics	
	CO 1: Define a general equation for gradient ,divergence ,curl & laplacian in an orthogonal, curvilinear & other coordinate system.
	CO 2: To explain relative motion, Galilean & Lorentz transformation equations.

PH-331: Mathematical methods of physics	CO 3: To show proper time , minkowskis space ,Time dilation , length contraction .
	CO 4: To explain Michelson Morley experiment & its negative result.
	CO 5:To solve Legendre polynomials, Hermite polynomials ,Bessel function of first kind.
PH-332: Solid state physics.	CO1: To draw crystal structure to develop it in 2D as well as 3D and to determine Indices for 'Directions' and 'Planes'.
	CO2: to show them with packing fraction, coordination number, number of atoms per unit cell etc.
	CO3: Differentiate the crystal structure by XRD diffraction for inter-planer distance.
	CO4: To show various experimental techniques for characterization of material.
PH-333: Classical Mechanics:	CO1: To solve advanced problems involving the dynamic motion of classical mechanical systems.
	CO2: Student can apply the concept of mechanics of system of particles to solve dynamics problems
	CO3: Student interpreted an intermediate knowledge of central-force motion and the concept of converting two body problems in one. .
	CO4: Interpreted an knowledge of concept of laboratory frame and center of mass frame to calculate results of scattering experiments.
	CO5: Student use the concept scattering to get important information regarding the nature of interaction.
	CO6: Derive Lagrange and Hamilton's equations, and represent the equations of motion for simple mechanical systems .
PH-334: Atomic and Molecular Physics	CO1: Obtain the formulae for total energy of an atom so that energy level diagram can be drawn.
	CO2: Student write laws, postulates in atomic and molecular Physics and able to compare various models of atomic structure.
	CO3: To Calculate quantum state of electrons in an atom, spectral notation and electronic configuration of atom.
	CO4: Obtain formulae for Zeeman shift, wavelength of emitted X-ray s, Raman effect.
	CO5:Student can study origin of line spectra and able to compare continuous spectra, characteristic spectra.
	CO6: To show application of Duane and Hunt's rule, Moseley's law and its importance, Raman effect and Auger effect.
	CO7: Student can explain X-ray spectra, spectrum , Raman spectra and molecular spectra using quantum treatment .
	CO1:Student define types of programming languages.
	CO2:To understand basic competency used C-language for programming;

PH-335: C programming	CO3:To explain operators and expression in C-programming and navigate commands;
	CO4: To explain control statements and loops as well as capable of writing C-program.
	CO5:To explain arrays and pointers.
	CO6: To solve different numerical methods for different types of problems.
PH-336 B: Material science	CO1: Student can explain solubility, deformation in metals, phase diagram, molecular phases and smart materials.
	CO2: Explain the imperfections in solids, mechanism of plastic deformation, properties of ceramic materials.
	CO3: To solve problems on stress and strain of materials, CRSS of single phase metals, weight in percentage of compositions using lever rule.
	CO4: Student can show the defects in solids, diffusion mechanisms and types of phase diagram.
	CO5: To differentiate between elastic deformation and plastic deformation, linear polymers and cross linked polymers
	CO6: Student can obtain the CRSS of metals and the lever rule for phase diagrams. Study types of smart materials, properties of smart materials and their applications.
PH-341: Electrodynamics.	CO1: Student can study the Biot-savart law, Amperes law, Coulombs law, Electric field,Magnetic field &Faradays law.
	CO2 : Understand the method of electrical images, equation of continuity, B.H curve, Maxwell's equation .
	CO3: Solve numerical problem on coulombs force, magnetic induction, magnetic permeability , magnitude of electric & magnetic vectors.
	CO4 : Student can calculate work done by charges, total charge, force on the wire in different symmetry.
	CO5: To analyse pointing vector, polarization, reflection &refraction.
	CO6: To explain Biot Savart law in different symmetry problem.
PH-342: Quantum Mechanics	CO1: To study the historical aspects of development of quantum mechanics & black body radiation.
	CO2: explain the differences between classical and quantum mechanics.
	CO3:To derive De Broglie hypothesis, wave function and uncertainty principle
	CO4: Obtain Schrodinger's time dependent & independent equation.

	CO5: solve Schrodinger's steady state equation for to obtain Eigen functions and Eigen values
	CO6: Use Schrodinger's spherically equation for H atom & rigid rotator.
	CO7: To write quantum numbers in atomic system, discuss different operator.
PH-343: Thermodynamics and Statistical Physics	CO1: To study transport phenomena, coefficient of thermal conductivity, viscosity and diffusion.
	CO2: To study the concepts and roles of thermodynamic functions.
	CO3: To solve Binomial distribution and Gaussian probability distribution.
	CO4: Discuss the concepts of microstate and macro state& basic postulates .
	CO5: Student can differentiate thermal, mechanical and general interaction between statistical system
	CO6: Student can compare MB, BE and FD distributions.
PH-344: Nuclear Physics	CO1: Student can study GM counter, threshold energy, nuclear fission, fusion, critical mass.
	CO2: To analyses the basic properties of nucleus.
	CO3: Classification of nuclear radiations, elementary particles and nuclear states, nuclear detectors
	CO4: Compare baryons and mesons with Quark model.
	CO5: Derive expression for energy of ions and frequency of RF signal in cyclotron, Q-value equation.
	CO6: Estimate binding energy from fission
PH-345 Electronics II	CO1: Review of amplification, voltage gain, line and load regulation, flip-flop, counters, register, multiplexer, de-multiplexer, etc.
	CO2: To show characteristics of various types of FET's and diode and construct a circuit.
	CO3:To study block diagram of IC 723, IC555, OPAMP .
	CO4: Compare various types of semiconductor diode (LED, photodiode, etc.) types of multi vibrator, types of power amplifier and 78XX,79XX.
	CO5: Draw a circuit for amplifier, a-stable, mono-stable and bi stable multi vibrator using IC555, IC723, various types of flip-flop and counters
	CO6: To study OP-AMP (IC741) as an adder, subs tractor, differentiator, integrator and comparator.
	CO7: To show POS and SOP expression on K-map and design of half adder & full adder.
	CO1: Student can study the thermal equilibrium and population inversion.

PH-346 K: Laser	CO2: Explain the absorption, spontaneous and stimulated emission with diagrams.
	CO3: Obtain the Einstein's relation, conditions for stimulated emission.
	CO4: Difference between ordinary light and laser light.
	CO5: Study the characteristics of laser light
	CO6: Student can Classify lifetime broadening, collision and Doppler broadening
Physics Practical-I	CO1: Describe the theory energy gap experiment in the course.
	CO2: Perform derivations of theory for the experiments in the course.
	CO3: Carry out instructions laboratory experiments in Optics, Thermodynamics, Mechanics, Modern Physics, Electronics and Electromagnetics
	CO4: Show their results, using correct procedures .
	CO5: Perform a quantitative analysis of experimental data .
	CO6: Interpret relationships in graphed data.
Physics Practical-II	CO1: Student can explain theory of experiments in the course.
	CO2: Student explain derivations of theory for the experiments in the course.
	CO3: Students can carry out experiments in Optics, Thermodynamics, Mechanics, Electronics and Electromagnetics
	CO4: Interprets results using correct procedures.
	CO5: Setup a experiment using a appropriate data .
	CO6: student can have interpreted relationships in graphed data and method of plotting.
Physics Practical-III : Project	CO1: Student can select appropriate project.
	CO2: Describe the theory of experiments in the course.
	CO3: Perform library work for the experiments in the course
	CO4: Student can interpreted, analyses results, using correct methods.
	CO5: Student can analyses the project data.
	PO1: To develop scientific attitude, provide in-depth knowledge of scientific and technological concepts of Physics.
	PO2: student get some research experience within a specific field of physics, through a project work
	PO3: To enrich knowledge through problem solving, minor/major projects, seminars, tutorials, review of research articles/papers, participation in scientific events, study visits, etc

Programme Outcomes M.Sc.-Physics	PO4: To familiarize with recent scientific and technological developments.
	PO5: use creativity, critical thinking, analysis and research skills to solve theoretical and real-world problems
	PO6: To create foundation for research and development in Physics
	PO7: use creativity, critical thinking, analysis and research skills to solve theoretical and real-world problems
	PO8: To help students to learn various experimental and computational tools thereby developing analytical abilities to address real world problems
	PO9: able to enter new problem areas that require an analytic and innovative approach
	PO10: be able to understand the role of physics in society and has the background to consider ethical problems
	PO11: know the historical development of physics, its possibilities and limitations, and understands the value of lifelong learning
	To help students to build-up a progressive and successful career in Physics.
PHCT111: MATHEMATICAL METHODS IN PHYSICS	CO-1-Student can study ector spaces and subspaces, Linear dependence and independence, Basis and t Dimensions, linear operators, Inverses.
	CO-2: Student can learn matrix representation of an operator, change of basis, unitary transformation. (These concepts should be discussed with the help of problems), Eigen values and eigen functions of SHM.
	CO-3 Student will get deep knowledge about Definition, Dirichlet's condition, Convergence, Fourier Integral and Fourier transform, Convolution theorem, Parseval's identity.
	CO-4 Student can get knowledge Fourier transform & Laplace transform of Dirac Delta function.
	CO 5 : Student learn Eigenvalues & eigenvectors of Hermitian & Unitary transformations, Diagonalization.
PHCT112: CLASSICAL MECHANICS	CO-1. Student will learn Concept of symmetry, invariance under Galilean transformation.
	CO-2 Student will be familiar Variation principle, Euler's equation, applications of variation principle, shortest distance problem, brachistrochrone, Geodesics of a Sphere
	CO-3 Student can perform Two body central force problem, stability of orbits, condition for closure, integral power laws, Kepler's problems, orbits of artificial satellites

PHCT113: QUANTUM MECHANICS	CO-1 Student learn about adequacy of classical Physics, wave packets and uncertainity relations. Schrodinger wave equation and probability interpretation.
	CO-2 Student learn about Simple one dimensional problems wells, barriers and harmonic oscillator (One dimension)..
	CO-3 Student learn about Representation of states and dynamical variables, observables, self adjoint operators, eigen functions and eigen values, degeneracy.
	CO-4 Student learn about Hilbert space, Dirac's bra and ket notation, dynamical variables.
PHOT114: ELECTRONICS	CO-1 Students can understand Study of Timer IC 555: Block diagram, Astable and monostable multivibrator circuits. And study of VCO IC 566 and its applications.
	CO-2. Students will learn Concept of Voltage Regulator using discrete componenets.
	CO-3 Students can learn Rigid body dynamics and Small Oscillations and other related calculations.
PHCP115: PHYSICS LABORATORY 1	CO-1 Student can understand Michelson Interferometer. Resistivity of Ge at various temperature by Four Probe method and determination of band gap
	CO-2 : Student familiar with Susceptibility, Gauy method. Ionic Conductivity of NaCl
	CO-3: Student will have deep knowledge of Skin depth in Al using electromagnetic radiation. Counting statistics, G.M. tube.
	CO-4: Student will get deep understanding of End point energy and Absorption coefficient using G.M.tube. Conductivity of Plasma at various pressure for AC/DC source
	CO 5: To understand Electron Spin Resonance. (ESR) Fabry-Parot Etalon.
PHCT121: ELECTRODYNAMICS	CO-1 Student will have idea Multipole expansions for a localized charge distribution in free space.
	CO-2. Student will learn linear quadrapole potential and field, static electric and magnetic fields in material media.
	CO-3 Student gain knowledge of Energy relations in quasi-stationary current systems
	CO-4 Student expose to the basic nhomogeneous wave equations, Lorentz's and Coulomb's gauges.
PHCT122: SOLID STATE PHYSICS	CO-1 Student can gain knowledge of Nearly free electron model, DC and AC electrical conductivity of metals. Bloch theorem (with proof).
	CO-2 Student learn Kronig-Penney model, Motion of electron in 1-D according to band theory.
	CO-3 Student can apply Classical theory of diamagnetism, Langevin theory of Paramagnetism, Quantum theory of Paramagnetism,

	CO-4 Student learn Ferromagnetism: Wiess theory, Curie point, Exchange integral, saturation magnetization and its temperature dependence.
PHCT123: Statistical Mechanics in Physics	CO1: Student learn about Specification of the state of the system, Macroscopic and Microscopic states
	CO2: Student learn about Equilibrium conditions and constraints, Distribution of energy between systems in equilibrium
	CO3: Student can understand micro-canonical ensemble, System in contact with heat reservoir, Canonical ensemble, Applications of canonical ensembles
PHOT124: ATOMS AND MOLECULES	CO-1 :Students will understand Atomic structure and atomic spectra
	CO-2: Student can understand Atomic structure and atomic spectra.
	CO-3: Student can ESR- Principles of ESR, ESR spectrometer, total Hamiltonian, hyperfine structure
	CO-4: Student can learn how to Laue theory of X-ray diffraction, Geometrical structure factor, Atomic scattering factor.
PHCP125: PHYSICS LABORATORY II	CO1: Student can Study of voltage controlled oscillator using IC-566
	CO2: Student can gain Frequency multiplier using PLL-565(for 2 & 3 operation using counter.) . Fold back power supply.
	CO3: Student can learn Diode pump using UJT. DAC (R-2R and Binary type for 4-bit).
	CO4: Student can analyses Pulse train generator. SMPS power supply
	CO5: Student can learn CVCC power supply. Active filter-Low pass, High pass, Band pass, and Notch Filter using OP-AMP
PHCT231: Physics of Semiconductor Devices	CO1: Student study the physical characteristics such as electronic structures, optical and transport properties of semiconductors and IV characteristics.
	CO2: Student gain knowledge the transport and optical properties of semiconductors.
	CO3: Student can deep sense electronic structures of semiconductors to their atomic and crystal characteristics.
	CO4: Student introduce with fundamental physics process with device characteristics.
	CO5: Students can relate fundamental principles and processes to operational semiconductor devices and their uses.
	CO6: Student can describe semiconductor properties, processes and device characteristics using equations.

PHCT232: LASERS	CO-1 Student will learn interaction of radiation with matter: Absorption, spontaneous and stimulated emission, population inversion, properties of laser.
	CO-2 Student can perform Three and four level system and rate equations, threshold pump power
	CO-3 Student can understand of Different types of gas lasers: He-Ne laser, nitrogen laser, CO2 laser
	CO-4 Student have basic knowledge ndustrial applications: Cutting, molding, melting, welding, drilling.
PHCT233: EXPERIMENTAL TECHNIQUES IN PHYSICS I	CO-1. Student will be able to perform Signals, random signals, and time series (basic), Signal analysis
	CO-2. Student can undestandc Important and fields applications of vacuum, kinetic theory of gases
	CO-3. Student can have knowledge of Vacuum Gauges: Mc Leod, Thermocouple (Pirani)
	CO-4. Student is able to understand Penning, Hot cathode ionization (triode type), Bayard-Alpert
PHOP 234: Physics of Nanomaterials	CO1: Student can deep sense about quantum size effect.
	CO2: Students can gain knowledge of Surface & Interface effects, Surface energy & Surface curvature.
	CO3:Student can explain the quantum confinement effect on properties of various types of inorganic nanoparticles, 1D nanostructures.
	CO4: Student can analyses chemical and physical principles in the synthesis of inorganic nanostructured materials.
	CO5: Student can appropriate synthesis techniques and characterization of different quantum nanostructures.
	CO6: student can describe how the nanoparticle size can affect the morphology, crystal structure, reactivity, and electrical properties.
	CO7: student can gain knowledge of influence of dimensionality of the nanomaterials on properties and their future applications.
PHCP235: Computational Physics	CO1: Student can understand theory & programs algorithm.
	CO2: Student can study flowchart chart of the concepts discussed.
	CO3: Students can write the program using flowchart.
	CO4: Enter the required value by running the programme on turbo C.
	CO5: Interpret the result.

	CO6: Visualize the motion of pendulum, oscillations and miller indices on turbo C
PHCT241: Nuclear Physics	CO1: Students gain knowledge of elementary particles and nuclear states in terms of their quantum numbers.
	CO2: Student can predict the properties of nuclear ground and excited states based on the shell model.
	CO3:Student describe the properties of strong and weak interactions.
	CO4:Students can explain the different processes by which ionizing radiation interacts with matter and the construction and applications of detectors.
	CO5: Student have the basic properties of nucleus.
	CO6: Student can gain knowledge of the kinematics reactions and decay processes.
	CO7: Student can analyses production and decay.
	CO8: Student can evaluate radiation energy losses by passage through the matter.
PHCT 242: Material Science	CO1: Student have deep sense of laws of thermodynamics, thermodynamic functions, phase diagram, molecular phases, diffusion.
	CO2:Students have knowledge of defects in the material and classify them.
	CO3: Student can analyses the imperfections in solids, the concept of phase & diagram, Construction & phase diagrams and reactions, mechanism of plastic deformation by slip, properties of ceramic materials,
	CO4: Student can Solve problems on Phase rule, weight in percentage of compositions using lever rule, diffusion, CRSS , thermodynamic problems.
	CO5: Student can analyses phase diagrams.
PHCT243: EXPERIMENTAL TECHNIQUES IN PHYSICS II	CO1: Students gain basics of Sources of Electromagnetic Radiations: Different types of radiations.
	CO2: Student can explain sensors: Sensor's characteristics, Classification of sensors
	CO3: Student learn the X-ray Diffraction – Production of X-rays, Types (continuous and characteristics)
	CO4: student can understand Bragg's diffraction condition, principle, instrumentation (with filters) and working,
	CO5: student can gain knowledge Laue's method, Rotating crystal method, Powder
	CO6: Student can understand Optical Microscopy: Principle, Instrumentation and Working of optical microscope.

PHOP 244 : Physics of Thin Films	CO1: student can gain knowledge of influence of dimensionality of the nanomaterials on properties and their future applications in thin films.
	CO2: Student can analyses chemical and physical principles in the synthesis of Thin Films.
PHCP:245: Project	CO1:student can design hypothesis for their work to be carried out.
	CO2:Student can describe the underlying theory of experiments in the project work.
	CO3: Student can describe the derivations of theoretical models of relevance for the experiments in the project.
	CO4: Perform a quantitative analysis of experimental data including the use of computational and statistical methods where relevant.
	CO5: Student can show their results, using correct methods.