Post Graduate Department of Physics

Programme Outcomes

BSc Programme Outcome

- Fundamental and Discipline specific knowledge: Apply knowledge of basic Physics, Mathematics and Chemistry fundamentals to solve the physical real world problems.
- Problem analysis: Identify and analyze well-defined Physics problems using structured standard methods.
- Experimental Analysis: Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
- Project Management: Making wise use of principles in physics individually, or in a group to manage projects and effectively communicate about well-defined problems in physics.
- Life-long learning: Ability to analyze individual needs and engage in updating in the context of technological changes.

Program Specific Outcome

The PSOs are:

- To demonstrate an understanding of principles and theories of Physics. These including the following: Basic Mechanics & Properties of Matter, Research Methodology, Thermodynamics & Statistical Mechanics, Electromagnetism, Spectroscopy, Optics, Classical Mechanics & Special Theory of relativity, Quantum mechanics, Atomic physics, Solid state physics, Digital Electronics & Programming in C etc
- . To articulate the fundamental principles of electrostatics and magnetostatics.
- An ability to apply principles of algebra and trigonometry to electricity and magnetism.
- An ability to demonstrate comprehension of similarities and differences among electric and magnetic systems.
- An ability to compute basic quantities in rotational mechanics.

- An ability to demonstrate comprehension of similarities and differences among mechanical systems.
- An ability to formulate, analyze and solve a multi-level problem in mechanics.
- An ability to apply basic knowledge of science to explain observable phenomena.
- Apply algebra and calculus, as well as graphical methods to solve physics problems.
- Demonstrate the ability to do simple lab experiments that apply the principles learned in theory classes.

Course Outcome of B.Sc Core Courses

Semester I

Programme name and code : PY1141- Basic Mechanics and properties of Matter

- Accure a basic knowledge in Mechanics and Properties of Matter
- Develop a strong foundation in Mathematics for their future courses
- Understand of concepts and principles related to mechanics and properties of matter.
- Analyze various oscillating systems obeying simple harmonic motion
- Examine the basic principles of mechanics
- Understand the conservation of energy and associated theory
- Understand the basic laws and theorems of fluid dynamics.

Semester II

Programme name and code : PY1221 – Heat and Thermodynamics

- Understand the fundamental thermodynamic properties and various laws of thermodynamics
- Solve problems using the properties and relationships of thermodynamic systems
- Analyze basic thermodynamic cycles
- Understand the various phenomena of transference of heat
- Develop an awareness on the working of heat engine
- Identify the effect of entropy affects the Universe

Semester III

Programme name and code : PY11341- Electrodynamics

- Introduce powerful tools for tackling wide range of topics in Electrodynamics
- Understand the concepts and properties of electric and magnetic fields in vacuum and matter
- Understand the theory of electrostatics and magnetostatics
- Understand the classical electrodynamics based on Maxwell's equations ,concepts and properties of electromagnetic wave propagation and emission
- Apply Maxwell's equations to a variety of problems and solve problems involving the propagation and scattering of electromagnetic waves in a variety of media, calculation of fields, the motion of charged particles etc
- Demonstrate an understanding of the characteristics of electromagnetic radiation.
- Evaluate various circuits including L,C, R and to analyze their complete response

Semester IV

Programme name and code : PY1441 – Classical and Relativistic Mechanics

- Introduce powerful tools for tackling wide range of topics in Classical Mechanics
- Develop skills to solve problems related to the Physical world. •
- Knowledge and understanding of the classical laws of motion.
- Competency in using the essential mathematical skills needed for describing mechanics and special relativity
- Problem solving skills- Lagrangian and Hamiltonian mechanics applied to basic systems.
- Understand the influence of classical mechanics and relativity on modern scientific development.
- Understand the role of mechanics and relativity in the everyday world
- Demonstrate an understanding of the basic principles of special theory of relativity and perform basic calculations in relativistic kinematics and dynamics

Semester V

Programme name and code : PY 1541- Quantum Mechanics

- Understand the emergence of quantum mechanics, wave properties of matter, general formalism on wave mechanics
- Understand how a wave function is interpreted in terms of probability, and appreciate its physical significance
- Understand how a wave function is interpreted in terms of probability, and appreciate its physical significance
- Apply Schrodinger equation to Hydrogen atom

- Apply principles of quantum mechanics to calculate observables on known wave functions
- Understand the fundamental quantum mechanical processes in nature

Programme name and code : PY1542- Statistical Mechanics Research Methodology and Disaster Management

- Explain statistical physics as logical consequences of the postulates of statistical mechanics
- Understand and use the methods of statistical mechanics to develop the statistics for Maxwell Boltzmann, Bose-Einstein, Fermi-Dirac distributions
- Understand the statistics of particles
- Understand some basic concepts of research and its methodologies , identify appropriate research topics , select and define appropriate research problem and parameters , prepare a project proposal ,organize and conduct research in a more appropriate manner ,write a research report and thesis
- Acquire a knowledge on Global natural disasters and communicate factors about health emergencies and diseases etc
- Analyze and communicate the processes of disaster management including disaster risk reduction, response, recovery etc and also to design and perform research on the different aspects of the emergencies and disaster events

Programme name and code : PY1543-Electronics

- Analyze simple electronic circuits based on diodes and transistors with special focus on designing amplifiers with discrete components
- Design and analyze bias circuits for BJTs and amplifiers for the basic categories (CB,CE and CC)
- Analyze oscillator circuits, feedback amplifiers, operation amplifiers etc

Programme name and code : PY1544-Atomic and Molecular Physics

- Understand the vector atom model
- Understand the change in behavior of atoms in external applied electric and magnetic field.
- Understand the rotational, vibrational, electronic and Raman spectra of molecules.
- Understand the electron spin and nuclear magnetic resonance spectroscopy and their applications.

Course Outcome of Open Courses

Programme name and code : PY1551- Energy Physics

This course is designed to give the students a scientific understanding of various energy systems, transform the world's energy systems, and discover new ways of generating and storing energy.

- Understand the various forms of conventional and non conventional energy forms
- Understand how energy can be obtained from sun ,wind, biomass, oceans, chemical resources etc
- Understand the various challenges facing in the availability of natural energy resources
- Understand the patterns of energy crisis and possible solutions ,energy options for the developing countries

Semester VI

Programme name and code : PY1641- Solid State Physics

- Understand the interatomic forces and bonds
- Gain basic knowledge of crystal systems and spatial symmetries
- Account for how crystalline materials are studied using diffraction
- Understand the principles of structure determination by diffraction.
- Understand the concept of reciprocal space and the significance of Brillouin zones
- Understand the conduction in metals • Understand the Magnetic, optical and electrical properties of materials

Programme name and code : PY1642- Nuclear & Particles Physics

- Gain a thorough understanding of the constituents of a nucleus, its basic properties, stability etc
- Understand about the various models used to explain the nucleus
- Understand the alpha, beta and gamma decay
- Apply the concepts of fission and fusion to power generation
- Understand the theory behind particle detectors
- Gain knowledge about the basics of particle physics and the conservation laws obeyed by them

Programme name and code : PY1643- Classical and Modern Optics

- Analyze the intensity variation of light due to Polarization, interference, diffraction and dispersion

- Understand a knowledge about optical fiber, its types and its application in communication
- Understand the working principle, recording, reconstruction and types in holography
- Understand the working principle of lasers

Programme name and code : PY 1644- Digital Electronics and Computer Science

- Gain a deep knowledge on number systems, types, conversion, coded number systems etc
- Equipped to design, construct and analyze basic logic circuits using logic gates
- Understand the arithmetic circuits and sequential circuits
- Understand the functioning of computer components, the process of problem solving using computer, internal organization of computer, memory hierarchy etc
- Able to enhance their analyzing and problem solving skills and use the same for writing programs in C++.

Programme name and code : PY1661 – Electronic Instrumentation(Elective Course

- Understand the concepts of measurement various electrical parameters with accuracy, precision, resolution, passive or active transducers for measurement of physical phenomenon etc
- Understand the functioning of signal generator, frequency counter, CRO and digital IC tester for appropriate measurement etc.

Course Outcome of Complementary Course For Mathematics Students

Semester I

Programme name and code : PY1131.1 – Mechanics and Properties of matter

- Understand the dynamics of rigid bodies, various theorems involved and derivations of expressions of moment of inertia of bodies of different shapes
- Understand the bending of beams and analyze the expression for young's modulus
- Understand the basics of surface tension and viscosity of fluid
- Analyse the basics of wave motion and oscillations

Semester II

Programme name and code : PY1231.1 - Thermal Physics and statistical mechanics

- Understand the various phenomena of transference of heat
- Understand the fundamental thermodynamic properties and various laws of thermodynamics
- Solve problems using the properties and relationships of thermodynamic systems
- Understand the concept of entropy during various types of processes • Understand the basics of statistical physics

Semester III

Programme name and code : PY1331.1 – Optics, Magnetism and Electricity

The course provides an introduction to electricity, magnetism, optics, Electric charge and electric fields, current and resistance, magnetic fields, the properties of light, optical instruments etc.

- Understand and analyze interference between waves
- Understand the phenomenon of diffraction and types of diffraction
- Understand the principle and operation of lasers and basics of light propagation through optical fibers
- Understand the types of magnetic materials and their properties
- Understand and analyze the emf induced in various ac circuits including inductor, capacitor, resistor, their combinations etc.

Semester IV

Programme name and code : PY1431.1ModernPhysicsandElectronics

- Understand various atom models, quantum numbers, properties of atomic nucleus and basics of radioactivity
- Understand the limitations of classical physics, foundation of quantum mechanics and the derivation of Schrodinger equations
- Knowledge and understanding about semiconductor devices like diodes, transistors etc, their characteristics and types of biasing
- Understand the basics of various number systems, logic gates and related theorems
- Understand the basics of Boolean algebra and Solve various Boolean expressions

Course Outcome of Complementary Course For Chemistry Students

Semester I

Programme name and code: PY1131.2 – Rotational dynamics and Properties of matter

- Understand the dynamics of rigid bodies, various theorems involved and derivations of expressions of moment of inertia of bodies of different shapes
- Understand the bending of beams and analyze the expression for young's modulus
- Understand the basics of surface tension and viscosity of fluid
- Analyse the basics of wave motion and oscillations

Semester II

Programme name and code: PY1231.2 – Thermal Physics

- Understand the fundamental thermodynamic properties and various laws of thermodynamics
- Solve problems using the properties and relationships of thermodynamic systems
- Analyze basic thermodynamic cycles
- Understand the various phenomena of transference of heat
- Develop an awareness on the working of heat engine
- Analyze the effect of entropy affects the Universe

Semester III

Programme name and code: PY1331.2 – Optics, Magnetism and Electricity

The course provides an introduction to electricity, magnetism, optics, Electric charge and electric fields, current and resistance, magnetic fields, the properties of light, optical instruments etc.

- Understand and analyze interference between waves
- Understand the phenomenon of diffraction and types of diffraction
- Understand the principle and operation of lasers and basics of light propagation through optical fibers
- Understand the types of magnetic materials and their properties
- Understand and analyze the emf induced in various ac circuits including inductor, capacitor, resistor, their combinations etc.

Semester IV

Programme name and code: PY1431.2 – Atomic Physics, Quantum Mechanics and Electronics

- Understand various atom models, quantum numbers, properties of atomic nucleus and basics of radioactivity
- Understand the limitations of classical physics, foundation of quantum mechanics and the derivation of Schrodinger equations
- Understand the Electromagnetic Spectrum Principles of various spectrometers and their applications.
- Knowledge and understanding about semiconductor devices like diodes, transistors etc, their characteristics and types of biasing
- Understand the basics of various number systems, logic gates and related theorems
- Understand the basics of Boolean algebra and Solve various Boolean expressions

Programme : M.Sc Physics

M.Sc. Programme Outcome:

- Define and explain fundamental ideas and mathematical formalism of theoretical and applied physics.
- Identify, classify and extrapolate the physical concepts and related mathematical methods to formulate and solve real physical problems.
- Identify and solve interdisciplinary problems that require simultaneous implementation of concepts from different branches of physics and other related areas.
- To define a research problem, translate ideas into working models, interpret the data collected, draw the conclusions and report scientific data in the form of dissertation.
- To disseminate scientific knowledge and scientific temper in the society to contribute towards greater human cause.

Programme specific outcomes.

On completing MSc in Physics programme, students will attain :

PSO 1 : Knowledge and insight into physics on an advanced level

PSO 2 : Extended knowledge of advanced mathematical methods

PSO 3 : Skill in in research and methodology in different areas of Physics

PSO 4 : Knowledge in undertaking a major, individual, physics-related project and reporting the results in a full scientific report and oral and poster presentation

PSO 5 : Ability to work with analytical and numerical methods in Physics

PSO 6: Ability to evaluate and analyse scientific measurement data.

PSO 7 : Ability to develop critical comments on each experiment done in the original records including sources and estimates of errors and limitations in the experiments done

PSO 8 : Thorough knowledge and experimental skill in the special paper Electronics

Course Outcome of Theory Papers

Semester I

Programme name and code: PH 211: Classical Mechanics

(i) Students are able to learn the concepts of Lagrangian and Hamiltonian mechanics and use them to solve problems in mechanics.
(ii) Able to learn concepts of generating functions, Poisson brackets Hamilton Jacobi equations and action angle variables.
(iii) To equip the students to deal with central force problem and analyzing Kepler's laws.
(iv) To inculcate the students the concepts of special and general theory of relativity and related problems.
(v) To acquaint the students about the theory of small oscillations and Euler's equations of motions of rigid bodies.
(vi) To analyze nonlinear dynamical systems and to explain the concepts of classical chaos.

Programme name and code: PH 212: Mathematical Physics

(i) To apply and analyze the various vector and matrix operations and to perform complex analysis for solving physical problems.
(ii) To demonstrate and utilize the concepts of Fourier series and its transforms.
(iii) To explain and differentiate different probabilistic distributions.
(iv) To apply partial differential equations and special functions for solving mathematical problems.
(v) To illustrate and apply concepts of group theoretical operations and tensors.

Programme name and code: PH 213: Basic Electronics

(i) To equip the students design and analyze different analogue and digital circuits.
(ii) To summarize the knowledge of basic arithmetic and data processing circuits and memory devices.
(iii) To equip the students to explain various components in optical communications systems and microwave devices.
(iv) To measure and analyze the different electronic signals.

Semester II

Programme name and code: PH 221: Modern Optics and Electromagnetic Theory

(i) To demonstrate the linear and nonlinear optical phenomena.
(ii) To explain and discuss propagation of electromagnetic waves through different media.
(iii) To restate formulations and relativistic effects in electrodynamics.
(iv) To analyse the propagation of electromagnetic waves through waveguides.
(v) To use radiation theory in developing different antennas.

Programme name and code: PH 222: Thermodynamics, Statistical Physics and Basic Quantum Mechanics

(i) To explain the basic thermodynamic relations, Maxwell's equations and its consequences.
(ii) To equip the students to demonstrate and apply classical and quantum statistics in different physical phenomena.
(iii) To distinguish the different phase transitions using Ising model.
(iv) Outline and apply foundations of quantum mechanics.

Programme name and code: PH 223: Computer Science and Numerical Techniques

(i) To summarize computer hardware and its operating systems
(ii) Explain internal architecture of microprocessors 8085 and create assembly language programing.
(iii) To develop and compile programs in python and C++.
(iv) Apply numerical methods to solve physical problems.

Semester III

Programme name and code: PH231: Advanced Quantum Mechanics

(i) To extend the use of approximation methods viz variation, WKB, time dependent and timeindependent perturbations.
(ii) To summarize different types of symmetry, conservation laws and quantum theory of scattering.
(iii) To distinguish different approximation methods, to study the structure and properties of many electron systems.
(iv) To compute eigen values of angular momentum and evaluation

Programme name and code: PH 232:Atomics and Molecular Spectroscopy

(i) Explain different symmetry operations and deduction of molecular structure.
(ii) Distinguish and classify the different spectra shown by atoms and molecules
(iii) Illustrate the various spectroscopic experimental techniques.

Programme name and code: PH 233 E: Advanced Electronics–I

(i) To summarize various techniques of digital and analog communication systems.
(ii) Generalize the idea of information theory
(iii) Illustrate various techniques for digital signal processing based Fourier and Z transform**.**

Semester IV

Programme name and code: PH 241: Condensed Matter Physics

(i) Discuss crystal physics, lattice vibrations, models of thermal properties and band theory of solids.
(ii) Explain the theoretical concepts of semiconductors, dielectric, magnetic and superconducting materials.
(iii)To describe the synthesis and characterization techniques of nanomaterials.

Programme name and code: PH 242: Nuclear and Particle Physics

(i) To describe and analyze nuclear structure, models and reactions.
(ii) To illustrate the mechanisms of nuclear fission and fusion reactions.
(iii)Discuss various nuclear detectors and particle accelerators.
(iv)To classify elementary particles and discuss their interactions.

Programme name and code: PH 243 E: Advanced Electronics-II

(i) Demonstrate microprocessor architecture, programming and interfacing devices.
(ii) Outline the basic concepts of embedded systems, artificial intelligence and neural networks.
(iii)Illustrate fundamental data communications codes, radar and satellite communication systems.

Course Outcome of Practical Papers

I Year practical Papers

Programme name and code: PH 251: General Physics Practicals

(i) To measure and analyze various physical quantities.
(ii) To calculate error in various general physics experiments.
(iii) To develop Experimental skills.

Programme name and code : PH 252 Electronics and Computer Science Practicals

(i) To design and construct various electronic circuits and its validation
(ii) To calculate errors in various electronics experiments
(iii) To develop Experimental and programming skills.

II Year Practicals

Programme name and code: PH 261 Advanced Physics Practicals

(i) To measure and analyze various physical quantities.
(ii) To calculate error in various advanced physics experiments.
(iii) To develop Experimental skills.
(iv) To analyse and point outs result of experimental data.

Programme name and code: PH 262 E Advanced Electronics Practicals

(i) To design and construct various electronic circuits and its validation.
(ii) To calculate error in various electronics experiments.
(iii) To develop and test assembly language programs using microprocessors