

B. Sc. Physics

Course Outcomes:

Core Papers:

PHY-HC-1016: Mathematical Physics-1: The students will be able to learn about the fundamental of vector analysis, various mathematical methods essential for solving the advanced problems in physics. It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics. The knowledge of mathematical physics would be beneficial in further research and development as it serve as a tool in almost every branch of science and engineering.

PHY-HC-1016: LAB:

Students would learn about numerical analysis and basic of computer programming in C or C++. Various practical problems related to applications of mathematical tools to solve the problems in physics would be learned by students.

PHY-HC-1026: Mechanics: The students will be able to learn about the fundamental of dynamics and behavior of physical bodies. The course provides the basic concepts related to the motion of all the objects around us in our daily life and builds a foundation of various applied field in science and technology; especially in the field of mechanical engineering. The course comprises of the study of laws of motion, momentum, energy, rotational motion, gravitation, fluids, elasticity and special relativity.

PHY-HC-1026: LAB: Students would perform basic experiments related to various measuring instruments and would learn the importance of accuracy of measurements. They would perform experiments related to elasticity and gravitation and acquire basic knowledge of it.

PHY-HC-2016: Electricity and Magnetism: This course provides an opportunity for the students to learn about basics of electricity and magnetism and their interactions. It also provides basic knowledge of dielectric material and magnetic material and their properties. The course also provides basic knowledge of electricity and magnetism, both as separate phenomena and as a singular electromagnetic force. The course contains electrostatics, magnetism, electromagnetic induction and Maxwell's equations. The course is very useful for the students in almost every branch of science and engineering.

PHY-HC-2016: LAB: Students would be able to measure resistance, current, voltages using a multi-meter. They would gain practical knowledge about different electrical circuits comprising of inductor, capacitor and resistance and their characteristics. Measurements of inductors, capacitors, resistance using different bridges are also incorporated.

PHY-HC-2026:: Wave and Optics: The course comprises of the study of superposition of harmonic oscillations, waves motion, oscillators, sound, wave optics, interference, diffraction, polarization. The course is important for the students to make their career in various branches of science and engineering, especially in the field of photonic engineering.

PHY-HC-2026:: LAB: The practical knowledge of wave motion doing experiments: Tuning fork, electric vibrations. They would also learn optical phenomena such as interference, diffraction and dispersion and do experiments related to optical devices: Prism, grating, spectrometers

PHY-HC-3016: Mathematical Physics: Would learn mathematical methods to solve the various problems in physics. The topics include the calculus of functions, Fourier transform, special functions and special integrals, partial differential equations, complex analysis and variables.

PHY-HC-3016: Lab: Use of computational method to solve physical problem would be learned by students.

PHY-HC-3026: Thermal Physics: The course makes the students able to understand the basic physics of heat and temperature and their relation with energy, work, radiation and matter. The students also learn how laws of thermodynamics are used in a heat engine to transform heat into work. The course contains the study of laws of thermodynamics, thermodynamic description of systems, thermodynamic potentials, kinetic theory of gases, theory of radiation and statistical mechanics.

PHY-HC-3026: LAB: Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf etc and perform various experiments using various apparatus.

PHY-HC-3036: Digital system & Applications: This course helps the students to gain basic ideas of the construction and working of electronic devices and circuits and to understand the fundamentals of communication systems. The course includes the study of number systems, Boolean algebra, logic gates, combinational circuits, sequential circuits, memory devices and IC technology. The course is of much practical purpose for the students to learn basics of digital electronics. The digital electronics has wide applications in computing, process control, signal processing, communication systems, digital instruments etc.

PHY-HC-3036: LAB: Students would physically experience about various electronic components and learn to design some basic electronic circuits and study their applications.

PHY-HC-4016: Mathematical Physics: Would learn complex analysis, complex integration, different transforms such as Fourier transform, Laplace Transforms etc to solve the various problems in physics.

PHY-HC-4016: Lab: This course would introduce students with the basic knowledge of computers and their applications in solving differential equations, complex equations, Fourier series etc.

PHY-HC-4026: Elements of Modern Physics: Students would know about the basic principles in the development of modern physics. The topics covered in the course build a basic foundation to study: quantum theory, blackbody radiation, uncertainty and wave-particle duality, Schrodinger wave equations, atomic models, nuclear physics. The course contains the study of spontaneous and stimulated emissions, optical pumping and about different lasers.

PHY-HC-4026: Lab: Students would be able to understand Basic experiments of modern physics such as: Determination of Planck's and Boltzmann's constants, Determination of ionization potential, Wavelength of H-spectrum, Single and double slit diffraction, Photo electric effect and determination of e/m .

PHY-HC-4036: Analog System & Applications: The students would gain the knowledge of Basic Electronics circuits, network theorems and measuring instruments: They would know about common solid state devices: Semiconductor diodes and transistors. The topics also include the Rectifiers, Filters and their applications, number systems and logic gates which are foundation blocks of digital electronics. Students would learn about electronic circuits such as Amplifiers and Oscillators. Various types of Amplifier and Oscillator circuits their working and applications in domestic, industrial and scientific devices/equipments.

PHY-HC-4036: Lab: Students would be able to understand about characteristics of diodes and transistors. Practically they will be able to know how to design amplifier in different modes using OP-AMP. Further they will gain the knowledge of the use of OP-AMP as integrator, differentiator.

PHY-HC-5016: Quantum Mechanics & Applications: The course provides an understanding of the behaviour of the systems at microscopic (atomic and nuclear) scale and even smaller. Students would learn basic postulates and formulations of quantum Mechanics. The course, in fact, plays an important role in explaining the behaviour of all physical systems in the universe. The course includes the study of a brief review of foundations of quantum mechanics, matrix formulation of quantum mechanics, symmetry in quantum mechanics and approximation methods for bound states.

PHY-HC-5016: Lab: This course would introduce students with the basic knowledge of computers programming and their applications in solving different problems related to quantum mechanics. Students will gain practical knowledge in Electron spin resonance (ESR), Zeeman effect, tunnel diode etc and will be familiar with these devices.

PHY-HC-5026: Solid State Physics: From this course students will be able to develop an understanding of the lattice, different types of crystal structures, symmetries. The student would gain insight about the interior of the substances using X-ray diffraction in crystals. This course also includes elastic waves, phonons, and lattice vibrational properties. The course forms a theoretical basis of experimental material science and technology. The course also includes the study of defects in crystals, magnetism, energy bands and dielectric and electrical properties of insulators. The course gives in depth understanding of dielectric and ferroelectric, piezoelectric properties and superconductivity.

PHY-HC-5026: Lab: The course Provides practical knowledge of various physical phenomena such as: magnetism, dielectrics, ferroelectrics and semiconductors. Students would gain a hands-on learning experience by performing experiments on these properties of materials. Students would be able to perform experiment to measure band gap, resistivity of semiconductor material.

PHY-HE-5036: (DSE) Advanced Mathematical Physics:

Students would be able to understand the mathematical methods essential for solving the advanced problems in physics using vector spaces, Matrix, General and Cartesian Tensor. It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics.

PHY-HE-5036: Lab: In This Course students would gain the practical knowledge by performing simulations based on different mathematical problems based on Matrix, Eigen value and Eigen function, Lagrangian formula etc.

PHY-HE-5056: (DSE) Nuclear and Particle Physics: In this course students would know about the general properties of nuclei, nuclear forces and detectors, radioactive decay and nuclear reactions. The course expands the knowledge of students especially, the various applications of nuclear physics. Students can learn about the most fundamental building blocks of matter and radiation, interaction among elementary particles and hence to understand their behaviour. The course builds a foundation for the students to carry out research in the field of nuclear physics, high energy physics, nuclear astrophysics, nuclear reactions and applied nuclear physics.

PHY-HC-6016: Electromagnetic Theory:

The study of electromagnetic theory provides basic foundation for the students to understand advanced courses of physics. The course involves the study of electromagnetic theory, Maxwell's equations and electromagnetic waves, Gauge transformations, properties of electro-magnetic waves in both bounded and unbounded media radiations from moving charges. They would gain detail knowledge on polarization and rotation of electromagnetic waves and wave guides. Brief knowledge about optical fibers is also incorporated.

PHY-HC-6016: Lab: The course Provides practical knowledge of various physical phenomena such as: polarization, reflection and total internal reflection of electro-magnetic wave. Will be familiar with the equipments like polarimeter, Gaussian eyepiece, grating etc.

PHY-HC-6026: Statistical Mechanics: The course includes the study of Basic postulates, application of classical distribution to ideal gases, imperfect gases, quantum statistics and black body radiation. The course is helpful for the students to understand the dynamics of the bulk material in macroscopic as well as microscopic levels. It is also useful to understand the relation between microscopic and macroscopic systems. The course also includes basic understanding of quantum theory of radiation, Bose-Einstein and Fermi-Dirac statistics.

PHY-HC-6026: Lab: In This Course students would gain the knowledge of simulations based on different numerical problems based on statistical mechanics. Course also includes computational work related to different statistical distribution functions.

PHY-HE-6016: Communication Electronics: The course is very important for the students to understand the broadcasting of a message signal from transmitter, its radiation mechanism (how modulated electrical signal is propagated in the form of radio waves) and its detection or demodulation (extraction of original message from modulated signal) at receiver. The course includes the study of modulation, demodulation, transmitters, receivers, TL, antenna, propagation of radio waves, TV, Radar systems. The course is gives the basic science of working of a wireless communications system. The course is also useful for the students to understand the basic function of Television and Radar systems.

PHY-HE-6016: Lab: Students would physically experience about various electronic components used in transmission and reception of signals like FM transmitter and receiver and learn to design some basic electronic circuits and study their applications.

PHY-HE-6036: Advanced Mathematical Physics: Students would be able to understand the mathematical methods essential for solving the advanced problems in physics. It would be helpful in the development of the ability to apply the mathematical concepts and techniques to solve the problems in theoretical and experimental physics. The knowledge of mathematical physics would be beneficial in further research and development as it serves as a tool in almost every branch of science and engineering.

PROGRAMME SPECIFIC OUTCOMES:

This undergraduate course in Physics would provide the opportunity to the students:

1. To understand the basic laws and explore the fundamental concepts of physics
2. To understand the concepts and significance of the various physical phenomena.
3. To carry out experiments to understand the laws and concepts of Physics.
4. To apply the theories learnt and the skills acquired to solve real time problems.
5. To enhance the student's academic abilities, personal qualities and this will give them an opportunity to develop as responsible citizens.
6. To produce graduates who excel in the competencies and values required for leadership to serve a rapidly evolving global community.
7. To motivate the students to pursue PG courses or other higher courses in reputed institutions.

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