Department of Physics, Pandu College, Guwahati-12

Programme Outcome

Physics is one of the fields of information that underlies the physical universe. Studying for a physics degree will offer a student with profits which last a life time, awareness and skills. These skills are useful in many frameworks, for example, a practical approach to problem-solving, the ability to reason clearly and to interconnect well. Regarding the course it covers with a wide range of applicability of the subject about which everyone can feel and act. The theoretical and experimental knowledge makes a person logical and rational in every aspect in such a way that he used to justify things through facts and truthfulness. Certain subjects within the course have paved the way for higher studies and Research at different levels. For examples, subjects like Quantum mechanics, Atomic and Nuclear physics, Solid state physics, Statistical Mechanics, Discipline Specific Elective (DSE) papers and different Skill Enhancement Courses (SEC) in newly introduced CBCS system.

The present course is designed in such a way that it can explore the possibility of getting the job for a graduate student in various government and private organizations which have been mentioned as follows:

1. Radio and telecommunications.
2. Radiological physics in the field of medical research.
3. Railway signal processing and management.
4. Technical assistants in various advance research laboratories, academic institutions, Forensic labs, medical diagnostics etc.
5. Different technical sectors in defence services and civil aviation.
6. Telecom sectors.
7. Teaching position in educational sector.
8. Instrumentation.

Course outcome:

Core Paper	Paper	Outcome
Mathematical Methods (for B.Sc. 1st, 3rd and 4th semesters)	**PHY-HC-1016, PHY-HC-3016, PHY-HC-4016.**	• Successful students should be able to understand vector and its applications in various fields, differential equations and its applications, different coordinate systems, concept of probability and error. • After successful completion of the course, students will be able to solve differential equation using power series solution method, solve differential equation using separation of variables method, special integrals, different properties of matrix, Fourier series. • On successful completion of the course students will able to solve complex integrals using residue theorem, apply Fourier and Laplace transforms in solving differential equations, understand properties of Tensor like Transformation of coordinates, contravariant and co-variant tensors, indices rules for combining tensors.
Mechanics (1st Semester)	**PHY-HC-1026**	• On successful completion of the course students should be able understand Inertial and non inertial reference frames, Newtonian motion, Galilean transformations, projectile motion, work and energy, Elastic and inelastic collisions, motion under central force, simple harmonic oscillations, special theory of relativity.
Electricity and magnetism (2nd Semester)	**PHY-HC-2016**	• After successful completion of this course, students will be able to Understand electric and magnetic fields in matter, Dilectric properties of matter magnetic properties of matter, electromagnetic induction,

		applications of Kirchhofff's law in different circuits, applications of network theorem in circuits.
Waves and Optics (2nd Semester)	**PHY-HC-2026**	• After successful completion of this course, students will be able to Understand superposition of harmonic oscillations, different types of wave motions, superposition of harmonic waves, interference and interferometer, diffraction, holography.
Thermal Physics (3rd Semester)	**PHY-HC-3026**	• Upon successful completion, students will have the knowledge and skills to identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, Thermodynamics potentials, Free energies, Maxwell's relations in thermodynamics, behaviour of real gases.
Digital System and Applications (3rd Semester)	**PHY-HC-3036**	• After successful completion of the course student will be able to understand the working principle of CRO, develop a digital logic and apply it to solve real life problems, Analyze, design and implement combinational logic circuits, Classify different semiconductor memories, Analyze, design and implement sequential logic circuits, Analyze digital system design using PLD, Simulate and implement combinational and sequential circuits.
Elements of Modern Physics (4th Semester)	**PHY-HC-4026**	• On completion of the course students will be able to understand modern development in Physics, Starting from Planck's law, it development of the idea of probability interpretation and the formulation of Schrodinger equation. Students will also get preliminary idea of structure of nucleus, radioactivity Fission and Fusion and Laser
Analog Systems & Applications (4th Semester)	**PHY-HC-4036**	• On successful completion of the course students will be able to understand about the physics of

		semiconductor p-n junction and devices such as rectifier diodes, zener diode, photodiode etc. and bipolar junction transistors, transistor biasing and stabilization circuits, the concept of feedback in amplifiers and the oscillator circuits, students will also have an understanding of operational amplifiers and their applications
Quantum Mechanics & Applications **(5th Semester)**	PHY-HC-5016	• On successful completion of the course students will be able to understand the principles in quantum mechanics, such as the Schrödinger equation, the wave function, the uncertainty principle, stationary and non-stationary states, time evolution of solutions, as well as the relation between quantum mechanics and linear algebra. Students will be able to solve the Schrödinger equation for hydrogen atom. Students will have the concepts of angular momentum and spin, as well as the rules for quantization and addition of these, spin-orbit coupling and Zeeman Effect.
Solid State Physics (5th semester)	PHY-HC-5026	• On successful completion of the course students should be able to explain the main features of crystal lattices and phonons, understand the elementary lattice dynamics and its influence on the properties of materials, describe the main features of the physics of electrons in solids; explain the dielectric ferroelectric and magnetic properties of solids and understand the basic concept in superconductivity.
Electromagnetic theory (6th semester)	PHY-HC-6016	• On successful completion of the course students will acquire the concepts of Maxwell's equations, propagation of electromagnetic (EM) waves in different homogeneous-isotropic as well as anisotropic unbounded and bounded media, production and detection of different types of

		polarized EM waves, general information as waveguides and fibre optics.
Statistical Mechanics (6^{th} semester)	PHY-HC-6026	• On successful completion of the course students will be learn the techniques of Statistical Mechanics to apply in various fields including Astrophysics, Semiconductors, Plasma Physics, Bio-Physics, Chemistry and in many other directions.
Discipline Specific Elective (DSE) Papers	**Paper**	**Outcome**
Advanced Mathematical Physics I **(5^{th} semester)**	PHY-HE-5036	• Upon completion of this course, students will be able to solve problems in Physics related to Linear Vector space, Matrix algebra, Tensor.
Particle and Nuclear Physics **(5^{th} semester)**	PHY-HE-5056	• Upon completion of this course, students will have the understanding of the sub atomic particles and their properties. They will gain knowledge about the different nuclear techniques and their applications in different branches of Physics and societal application. The course will develop problem based skills and the acquire knowledge can be applied in the areas of nuclear, medical, archeology, geology and other interdisciplinary fields of Physics and Chemistry.
Astronomy and Astrophysics **(6^{th} Semester)**	PHY-HE-6046	• Upon completion of this course, students will be able to understanding the origin and evolution of the Universe. The course will give a comprehensive introduction on the measurement of basic astronomical parameters such as astronomical scales, luminosity and astronomical quantities. It will give an overview on key developments in observational astrophysics. Students will have the idea of the instruments implemented for astronomical observation, the formation of planetary system and its evolution with time, the

		physical properties of Sun and the components of the solar system; and stellar and interstellar components of our Milky Way galaxy. Students will have the understanding of the origin and evolution of galaxies, presence of dark matter and large scale structures of the Universe.
Classical Dynamics **(6th Semester)**	PHY-HE-6056	• Upon completion of this course, students will have the overview of Newton's Laws of Motion, Special Theory of Relativity by 4-vectoer approach and fluids. Students will also have the understanding of the Lagrangian and Hamiltonian of a system.. By the end of this course, students will be able to solve the seen or unseen problems/ numericals in classical mechanics.
Generic Elective (GE) Papers	**Paper**	**Outcome**
Mechanics	PHY-HG-1016	• Upon completion of this course, students are expected to understand the role of vectors and coordinate systems in Physics, solve Ordinary Differential Equations, laws of motion and their application to various dynamical situations, Inertial reference frames their transformations, concept of conservation of energy, momentum, angular momentum and apply them to basic problems, phenomenon of simple harmonic motion, motion under central force, concept of time dilation, Length contraction using special teory of relativity. In the laboratory course, after acquiring knowledge of how to handle measuring instruments (like screw gauge, Vernier calipers, travelling microscope) student shall embark on verifying various principles and associated measurable parameters.
Electricity &	PHY-HG-2016	• Upon completion of this course,

Magnetism		students are expected to apply Gauss's law of electrostatics to solve a variety of problems, calculate the magnetic forces that act on moving charges and the magnetic fields due to currents, have brief idea of magnetic materials, understand the concepts of induction, and apply them to solve variety of problems. In the Lab course, students will be able to measure resistance (high and low),Voltage, Current, self and mutual inductance, capacitor, strength of magnetic field and its variation, study different circuits RC, LCR etc.
Thermal Physics & Statistical Mechanics	PHY-HG-3016	• Upon completion of this course, students are expected learn the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations, Maxwell's thermodynamic relations, fundamentals of the kinetic theory of gases, Maxwell-Boltzman distribution law, equipartition of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion, black body radiations, Stefan-Boltzmann's law, Rayleigh-Jean's law and Planck's law and their significances, quantum statistical distributions, viz., the Bose-Einstein statistics and the Fermi-Dirac statistics. In the laboratory course, the students will be able to Measure of Planck's constant using black body radiation, determine Stefan's Constant, coefficient of thermal conductivity of a bad conductor and a good conductor, determine the temperature coefficient of resistance, study variation of

		thermo emf across two junctions of a thermocouple with temperature etc.
Waves & Optics	PHY-HG-4016	• Upon completion of this course, students are expected to understand Simple harmonic oscillation and superposition principle, importance of classical wave equation in transverse and longitudinal waves and solving a range of physical systems on its basis, concept of normal modes in transverse and longitudinal waves: their frequencies and configurations, interference as superposition of waves from coherent sources derived from same parent source, Demonstrate understanding of Interference and diffraction experiments, Polarization. In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. Resolving power of optical equipment, the motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves.
Skill Enhancement (SE) Papers	**Paper**	**Outcome**
Physics Workshop Skills	PHY-SE-3014	• Upon completion of this course, students can experience with various mechanical and electrical tools through hands-on mode
Research & Technical Writing	PHY-SE-4024	• Upon completion of this course, students can aware about importance of research and technical writing. This course provides students with an introduction to technical writing, graphing and data analysis, and computer presentation with LaTex, Origin and Microsoft excel.