

Department of Physics

Programme Outcome:

The undergraduate course in Physics provides the following opportunities to the students:

- The students will acquire scientific knowledge in the fundamental areas of Physics through the study of Classical Mechanics, Electromagnetic Theory, Optics, Heat and Thermodynamics, Statistical Mechanics, Solid State Physics, Nuclear Physics, Modern Physics, Quantum Mechanics etc. With these courses the students would be able to have strong foundation knowledge and comprehend the basic concepts and principles in Physics.
- Through their practical syllabus, the students will learn use of appropriate level of technology for : a) experimental design and implementation, b) analysis of experimental data, and c) numerical and mathematical methods in problem solving.
- The students will acquire a fair amount of computational skill using open source software packages such as Gnuplot, Python, Numpy, Scipy, Matplotlib, LaTeX etc. in both Linux and Windows platforms. These courses facilitate applying the theories learnt and the skills acquired to solve real time problems. This will not only prepare them for higher studies or multidisciplinary research but it also opens up various kinds of job opportunities in the IT sector and other industries.
- The students will learn effective communication skills to present their knowledge of Physics from basic concepts to specific advanced areas in the form of preparation of laboratory notebook, project work, seminar presentation, poster presentation, models and other modes.
- The students will learn to work independently as well as in a group during laboratory sessions, projects and student seminars.
- The student will acquire a purposeful knowledge of scientific literature and ethical issues related to Physics.
- The students would be able to take up competitive exams in different sectors, go for higher education in Physics and can be entrepreneurs.
- Students will get academic exposure through the various internships offered by reputed National Research Institutes during their UG tenure. They will be able to utilize the small summer/ winter recesses through their involvement in small projects under careful guidance of reputed faculties and may get the flavor of the current trend of research.

Course outcome:

Course Code	Course Name	Course Outcome
CC1	Mathematical Physics I	This paper introduces some essential and basic topics in mathematics that are extremely useful while studying various topics of classical and quantum physics. Ordinary differential equations, vector calculus and linear algebra (particularly matrices) are taught in this course along with some general topics of introductory calculus. This paper trains the students with preliminary skills that are essential for studying nature using the language of mathematics. Students are introduced to programming with python (one of the most widely used programming languages) and plotting graphs using gnuplot.
CC2	Mechanics	This paper deals with some important topics of Classical Mechanics. Students learn at an advanced level some basic ideas of linear and rotational dynamics, work and energy, gravitation and central force motion, non-Inertial systems & fluid motion. Students are trained to have a knowledge of the motion of bodies under the influence of forces or with the equilibrium of bodies when all forces are balanced. Students get familiar with numerous types of problems and learn how to solve those from the study of one of the oldest branches of physics.
GE1	Mechanics	This paper deals with some important topics of Classical Mechanics. Students get some basic ideas of linear and rotational dynamics, work and energy, gravitation and central force motion, oscillations, general properties of matter such as elasticity, surface tension.
CC3	Electricity and Magnetism	This paper trains the students with the knowledge about electrostatics, magnetostatics and electrodynamics that form the backbone classical physics of charged particles. Students also acquire some preliminary knowledge of circuit and network theory for alternating current.
CC4	Waves and Optics	In this course students will learn about various types of oscillatory motions. They are able to calculate energy loss due to damping, resonance conditions etc. They also learn formation of Lissajous figures, wave propagation along a stretched string etc. In wave optics students learn the theory of Interference and diffraction. In the laboratory they perform various experiments in waves and optics like Newton's ring, Biprism, diffraction using grating etc which boost their theoretical understanding.
GE2	Electricity and Magnetism	This course is offered to the students from other departments. In this course they learn electrostatics, magnetostatics, electrodynamics. In the laboratory they measure unknown resistance using

		carey foster bridge, horizontal component of earth's magnetic field. Also learn how to convert a voltmeter to an ammeter and an ammeter to a voltmeter.
CC5	Mathematical Physics II	Some advanced areas of Mathematics in differential and integral analysis such as series solution, Fourier analysis and Fourier series, Integral and Fourier transform, partial differential equation and probability theory and probability distribution have been discussed in this course. This will develop in the students the problem solving ability in different areas of Physics such as fluid mechanics, heat flow, transport phenomena, waves and vibration, data analysis, classical field theory and other problems in mechanics. The students are trained through discussion of techniques and problem solving methodology as well. On successful completion of the course students can apprehend the problems in mechanics and will be able to solve them analytically.
CC6	Thermal Physics	In this course students learn the first and second law of thermodynamics, the concept of entropy. They are able to calculate change of entropy in various processes. They also learn thermodynamic potentials, conditions for first and second order phase transition. Students learn the behavior of gas molecules for both ideal and real gas in the light of kinetic theory of gas. They also get ideas of some essential features of rectilinear propagation of heat through solids.
CC7	Modern Physics	In the first part of this course, students are introduced to the fascinating world of quantum physics where they get a taste of what happens in the microscopic regime. In the later part of the course, the properties of the atomic nuclei, different models of nuclear theory, beta decay, fission, fusion etc are introduced. In the last section, the basic theory of LASERS and their fundamental properties are included.
SEC A	Scientific Writing	Here students are trained how to write scientific articles using LaTeX.
GE3	Thermal Physics and statistical Mechanics	This course is offered for students from other departments. In this course students learn thermodynamics, kinetic theory of gasses, theory of radiation and some basic theory of statistical mechanics. In the laboratory they perform experiments like measurement of thermal conductivity of a bad conductor, verification of Steafan's law etc.
CC8	Mathematical Physics III	This is the most advanced paper on mathematical physics, present in the UG curriculum. In this course students learn complex analysis, special theory of relativity and calculus of variation. These topics are extremely relevant for advanced studies of Physics in the 5 th and 6 th semester and for Higher Studies.
CC9	Analog Electronics	This paper is associated with analog systems and their

		applications- a broad topic of analog electronics. Students learn some basic ideas of circuits and network analysis, semiconductor diodes and their application, transistors and their biasing, regulated power supply, feedback amplifiers and OPAMP and knowledge of all these to design special electronic circuits such as multivibrators, oscillators etc. Students are trained to design analog electronics circuits and to analyze them from a problem solving attitude.
CC10	Quantum Mechanics	This is a course on quantum mechanics. The physics in the atomic scale is dealt with in this course. Both analytical and numerical methods (using python programming) to study quantum systems are discussed in this course.
SECB	Electrical Circuits and Network skills (Theory)	In this knowledge skill-based theory course on electrical circuits and network skills, students get basic ideas of dc and ac machines – both generators and motors, transformers-construction and basic principle of working and finally electrical measurements and faults. They are trained to have some theoretical knowledge of some familiar electrical instruments and basics of electric power distribution.
GE4		This course is offered to students from other departments. In this course students learn the theories and applications of waves and optics.
CC11	Electromagnetic Theory	In this course students learn how electromagnetic waves can be polarized with polarizing devices such as nicol prisms, babinet's compensator etc. In the laboratory they determine specific rotation of sugar solution, verify Malus law, study Fresnel's law etc which enrich them with their theoretical understanding.
CC12	Statistical Physics	In this course students learn the theory of Classical and quantum statistical mechanics such as MB,BE and FD statistics which are essential for learning other courses of physics. Also learn the theory of radiation. In the practical class students are trained to solve real life problems that involve application of random numbers.
DSE A1	Laser and Fiber Optics (Theory)	This paper deals with theoretical understanding of LASER and fiber optics systems. Students learn theoretical aspects of lasing action, basic properties of laser along with its transient effects. They get familiar with basic laser systems- constructions, properties and uses. In the second part of this paper, students learn some essential features of fiber optics, holography and non-linear optics. They are also trained to be familiar with some course-related problems and learn how to solve those.
DSE B1	Astronomy and Astrophysics	This course provides the students basic knowledge and analytic skills on various topics of Large Scale physics, like Astronomy, Cosmology and Astrophysics. These topics are currently very important for active research.

CC13	Digital Systems and Applications	This paper is associated with Digital systems and applications. Students learn different types of integrated circuits, different number systems, implementation of Boolean algebra, combinational and sequential circuits and A/d, D/a converter. They also get knowledge on computer hardware. Students are trained to design digital electronics circuits and to analyze them from a problem solving attitude.
CC14	Solid State Physics	After completing this course students understand various types of crystal structure.They learn theory of lattice vibration, specific heat of solid, magnetic and dielectric properties of materials. In the laboratory they do experiments like measurement of susceptibility of a paramagnetic substance, Hall coefficient of a material, energy band gap of a semiconductor etc.
DSE A2	Nano Materials and Applications	This 21st century is the era of nanotechnology. In the last few years it has advanced in leaping speed, both in the theoretical understanding of the Physics behind the behaviour of the nanomaterials and the the development of nanodevices. In this course, it is intended to give a flavour of different synthesis techniques of nanomaterials and their physico-chemical characterisation techniques. The basic properties such as optical, electronic, magnetic and optoelectronic properties are also discussed to some extent. It is expected that in going through the course, the students will gain the basic knowledge of nanomaterials-their properties and synthesis, nanoelectronic devices-their fabrication technique and the area of application. The completion of the course surely motivates and trains them to go for higher education in this particular field.
DSE B2	Communication Electronics (Theory)	In this theoretical paper, students get familiar with modern-age communication systems. They learn basic ideas of electronic communication, analog modulation, analog and digital pulse modulation and basic communication and navigation systems. They acquire some advanced level knowledge on analog and digital modulation techniques and they get some basic ideas of satellite communication and mobile telephony systems. They are also trained to be familiar with some course-related problems and learn how to solve those.