Physics	
Name of Course	**Course Outcomes**
PHSA-CC-1-1-TH: Mathematical Physics – I - Theory PHSA-CC-1-1-P: Mathematical Physics – I - Practical	CO1: The students will learn basic mathematical tools required to study theoretical and experimental physics. CO2: They will also learn how to use these mathematical tools to explain various physical phenomena. CO1: They will also learn basics of programming in open-source programming language Python. CO2: The student will also learn how to use open-source graph plotting software Gnuplot embedded in the open OS Linux. CO3: This course enables a student to build the foundation of application of computational techniques in any branch of theoretical and experimental physics as well as in any interdisciplinary branch of research in future.
PHSA-CC-1-2-TH: Mechanics – Theory PHSA-CC-1-2-P: Mechanics -Practical	CO1: This course is a prerequisite in the study of classical foundation of physics at entry level. The core of this course is Newtonian mechanics and its application in explaining various classical phenomena. CO1: This course teaches students to perform experiments to verify different laws related to Newtonian mechanics. CO2: It also enables them to calculate various physical quantities as described in the theory course.
PHSA-CC-2-3-TH: Electricity and Magnetism - Theory	CO1: The students will be given an idea about electricity (both static and current) and magnetism and various electromagnetic phenomena such as electromagnetic induction, electrical circuits, etc. CO2: Being a fundamental pillar for study in physics and engineering, it explains the students about various application of electricity and magnetism in our daily

	life. CO3: This course is a prerequisite for advanced topics in electromagnetic theory.
PHSA-CC-2-3-P: Electricity and Magnetism - Practical	CO1: The practical experiments that are being performed in this course will enable a student to get familiar with various electrical components such as power supply, multimeter and various other measuring instruments. CO2: The students will be able to perform various experiments on electricity and magnetism in this course and will learn about precautions to be taken during performing an experiment with electrical equipment.
PHSA-CC-2-4-TH: Waves and Optics - Theory PHSA-CC-2-4-P: Waves and Optics - Practical	CO1: The students will be given basic knowledge in vibration, wave motion and wave theory of light. CO2: The study of classical harmonic oscillator and wave motion gives them an insight about the CO3: he phenomena of interference, diffraction and polarization of light and its applications enables a student to progress to more advanced topics of Physics. CO1: The laboratory practical course familiarizes the students with experiments with optical instruments and measurement of various opticalparameters.
PHSA-CC-3-5-TH: Mathematical Physics – II - Theory	CO1: Students will learn more advanced topics of mathematical physics like Fourier series and its application. CO2: They'll also learn series solution of the differential equation, some special functions and their application. CO3: Partial differential equations will also be taught in this course along with some improper integrals that are important for studying theoretical aspects in

	various branches in physics.
PHSA-CC-3-5-P: Mathematical Physics – II - Practical	CO1: In the hands-on practical section, students will learn different packages of Python like numpy, scipy, matplotlib etc. and apply them to find the solutions of problems of matrix algebra, numerical integration, interpolation, solution of differential equation and curve fitting.
PHSA-CC-3-6-TH: Thermal Physics – Theory	CO1: In this course, thermodynamics is introduced to explain the fundamental laws of nature. Students will learn the principle of operation of engines and refrigerators in this course. They will also learn about entropy and thermodynamic potential, an essential concept in explaining chemical reactions. CO2: The students learn the basic energy distribution laws thermal Physics and to explain the basic laws and limitations related to ideal gas.
PHSA-CC-3-6-P: Thermal Physics – Practical	CO1: In this course the student will perform different experiments on heat and thermodynamics that will enhance their experimental skill.
PHSA-CC-3-6-TH: Digital Systems and Applications – Theory	CO1: The students will learn the fundamentals of codes and number system, the binary arithmetic, logics and Boolean functions also to simplify circuits and Boolean expressions using the Boolean laws. Simplify Boolean algebra expressions using Karnaugh maps. CO2: In this course, the students will understand the functions and working of flipflops, counters and registers and their applications into memory circuits. Design different registers and counters. CO3: Design basic combinational and sequential logic circuits.
PHSA-CC-3-6-P: Digital Systems and Applications – Practical	CO1: The students will be able to design and analyze digital logic circuits using different components taught in the theoretical section.

PHS-A-SEC-A-TH: Basics of Programming and Scientific Word Processing – Theory	CO1: This course is a theoretical technical skill enhancement course. In this course, the students will learn the basic elements of programming through programming in C/FORTRAN. CO2: They will also get an introduction to graphical analysis and graphical plotting software Gnuplot. CO3: The students will learn how to prepare a scientific article containing figures, tables and mathematical equations in a presentable form through open-source scientific writing software LaTex.
PHS-A-CC-4-8-TH: Mathematical Physics - III – Theory PHS-A-CC-4-8-P: Mathematical Physics - III – Practical	CO1: The students will learn some of the mathematical tools such as complex analysis and its application. CO2: They will also learn about integral transform by means of Fourier transform as an extension of Fourier analysis taught in the last semester. CO3: The students will also be acquainted with the concept of special theory of relativity which is extremely essential for understanding the physical world beyond Newtonian mechanics. CO4: The mathematical rigour and the fundamental concepts of probability theory will also be taught in this course. CO1: The students will learn advanced level Python programming to evaluate numerical solution of differential equation and partial differential equations.
PHS-A-CC-4-9-TH: Elements of Modern Physics – Theory	CO1: The limitations of classical mechanics and classical electromagnetism will be presented in this course and the students will be introduced to the curious world of quantum physics. CO2: The students will become familiar with the mathematical tools and their physical implications in some model quantum systems – a clear deviation from the classical macro level. CO2: The students will learn basics of nuclear physics

	- nuclear structure,radioactivity, nuclear fission & fusion. CO3: They will also learn fundamental principle of Laser and its applications.
PHS-A-CC-4-9-P: Elements of Modern Physics – Practical	CO1: This laboratory classes will familiarize the students to the topics learnt in the theory section through the determination of the value of Planck's constant, study of photoelectric effect, verification of Stefan's law of radiation, determination of e/m of electron and behaviour of tunnel diode.
PHS-A-CC-4-10-TH: Analog Systems and Applications – Theory	CO1: The basics of analog electronics is taught in this course which is the heart of the modern-day electronic devices. They will understand the fundamentals of semiconductor physics and its application. PSO2: Students will learn about the operation, characteristics and various applications of different analog devices and working of amplifier and oscillator.
PHS-A-CC-4-10-P: Analog Systems and Applications – Practical	CO1: This laboratory sessions will help the students to get familiarize with the electronic devices and to design and perform experiments with electronic components.
PHS-A-SEC-B-TH: Renewable Energy and Energy Harvesting – Theory	CO1: Students will be able to understand the concept of fossil fuels and alternate Sources of energy. CO2: They will learn in detail about various renewable energy sources – solar energy, wind energy harvesting, ocean energy, geothermal energy, hydro energy, piezoelectric Energy harvesting and electromagnetic energyharvesting.
PHS-A-CC-5-11-TH: Quantum Mechanics and Applications – Theory	CO1: The students will learn thoroughly Schrodinger equation and its application in the case of simple harmonic oscillator and hydrogen like atoms in this advanced Quantum Mechanics course. CO2: They will also understand the concept of generalized angular momenta and spin and its

PHS-A-CC-5-11-P: Quantum Mechanics and Applications – Practical	application in the case of hydrogen spectra and fine structure splitting. CO3: The interaction of atoms in magnetic and electric field is also being taught in this course. CO1: The numerical solution of some of the Schrodinger equations in Python will be taught in this course.
PHS-A-CC-5-12-TH: Solid State Physics – Theory PHS-A-CC-5-12-P: Solid State Physics – Practical	CO1: This course explains the physical properties of the material in solid states as an application of quantum mechanics. CO2: The basis of semiconductors and superconductors can be also explained with this theory. CO1: This laboratory sessions will give enough exposure to the students to design and perform experiments with solid state materials.
PHS-A-DSE-A1-TH: Laser and Fiber Optics – Theory	CO1: Students will be able to learn the basic and the generation of different types of LASER and their application. CO2: The mathematical framework of working of Fiber Optics
PHS-A-DSE-B1-TH: Nuclear and Particle Physics – Theory	CO1: This topic in Nuclear Physics introduces the student to the concept of nuclear reaction, interaction of nuclear radiation with matter and detectors for nuclear radiation. CO2: Students will also learn about the particle accelerators and also about fundamental particles and their properties in this course.
PHS-A-CC-6-13-TH: Electromagnetic Theory – Theory	CO1: This course teaches the students about the origin and different properties of the EM waves. CO2: Propagation of EM waves in unbounded and bounded media are also being taught in this course.

	CO3: Electromagnetic origin of wave optics and polarization is also being discussed in this course.
PHS-A-CC-6-13-TH: Electromagnetic Theory – Practical	CO1: The verification of different physical laws related to the EM wave propagation is done through the laboratory sessions.
PHS-A-CC-6-14-TH: Statistical Mechanics – Theory	CO1: In this course, the students will be able to understand the behaviour and dynamics of a system comprising of a large number of particles. CO2: The Classical Statistical Mechanics teaches them about the classical nature of the system through classical theory of radiation. CO3: Quantum Statistical Mechanics deals with those collections of particles where obeying the laws of quantum mechanics is a necessity and approximation by classical mechanics is no longer valid.
PHS-A-CC-6-14-P: Statistical Mechanics – Practical	CO1: Python programming is used to analyze the behaviour of a collection of particles through numerically calculate partition function and other physical properties.
PHS-A-DSE-A2-TH: Nano Materials and Applications – Theory	CO1: The exciting world of nanotechnology is being discussed here through the basic physics underlying the concept of nano particles. The synthesis and the properties of the nano materials are also being discussed in this course.
PHS-A-DSE-B2-TH: Advanced Statistical Mechanics – Theory	CO1: This advanced course in Statistical Mechanics introduces the student to the concept of Ising model and non equilibrium statistical mechanics.

Physics General Course	
Name of Course	Course Outcomes
PHS-G-CC-1-1-TH: Mechanics – Theory	CO1: This course is a prerequisite in the study of classical foundation of physics at entry level. The core of this course is Newtonian mechanics and its application in explaining various classical phenomena.

	CO2: Students will also learn about some general properties of matter – elasticity, surface tension and viscosity.
PHS-G-CC-1-1-P: Mechanics -Practical	CO1: This course teaches students to perform experiments to calculate different quantities related to Newtonian mechanics.
PHS-G-CC-2-2-TH: Electricity and Magnetism - Theory	CO1: The students will be given an idea about electricity (both static and current) and magnetism and various electromagnetic phenomena such as electromagnetic induction, electrical circuits, etc.
PHS-G-CC-2-2-P: Electricity and Magnetism – Practical	CO1: The practical experiments in this course are modelled in such a way that the students get familiar with various experiments on electricity and magnetism.
PHS-G-CC-3-3-TH: Thermal Physics and Statistical Mechanics – Theory	CO1: In this course, students will learn thermodynamics to explain the fundamental laws of nature. CO2: The students will also learn about the kinetic theory of gases and elementary theory of statistical mechanics.
PHS-G-CC-3-3-P: Thermal Physics and Statistical Mechanics – Practical	CO1: Student will learn to perform various experiments on heat and thermodynamics in this course.
PHS-G-CC-4-4-TH: Waves and Optics – Theory	CO1: The students will be given basic knowledge in vibration and wave motion. CO2: The concept of wave theory of light will be discussed through interference, diffraction and polarization of light and their applications.
PHS-G-CC-4-4-P: Waves and Optics - Practical	CO1: The laboratory practical course deals with the experiments on optics and sound.
PHS-G-SEC-B-TH: Renewable Energy and Energy Harvesting – Theory	CO1: Students will be able to understand the concept of fossil fuels and alternate Sources of energy. CO2: They will learn in detail about various renewable

	energy sources – solar energy, wind energy harvesting, ocean energy, geothermal energy, hydro energy, piezoelectric Energy harvesting and electromagnetic energy harvesting.
PHS-G-DSE-A-TH: Analog Electronics – Theory	CO1: Students will learn the basics in analog electronics and will also understand the operation, characteristics and various applications of different analog devices and working of amplifier and oscillator.
PHS-G-DSE-A-P: Analog Electronics – Practical	CO1: In the laboratory course, students will perform experiments with various electronic components like transistors, OPAMPs, etc.
PHS-G-SEC-A-TH: Basics of Programming and Scientific Word Processing – Theory	CO1: This course is a theoretical technical skill enhancement course. In this course, the students will learn the basic elements of programming through programming in C/FORTRAN. CO2: They will also get an introduction to graphical analysis and graphical plotting software Gnuplot. CO3: The students will learn how to prepare a scientific article containing figures, tables and mathematical equations in a presentable form through open-source scientific writing software LaTex.
PHS-G-DSE-B-TH: Digital Electronics – Theory	CO1: The students will learn the fundamentals of digital electronics starting from number system and elementary digital circuits, the functions and working of flipflops, counters and registers and their applications into memory circuits.
PHS-G-DSE-B-P: Digital Electronics – Practical	CO1: The students will be able to design and analyze digital logic circuits using different components taught in the theoretical section.