BSC PHYSICS

Semester 1 – Core Course I

PHY1B01: METHODOLOGY OF SCIENCE AND BASIC MECHANICS

36 hours (Credit - 2)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the features, methods and limitations of science	PSO1	U	C
CO2	Able to understand and apply the basic concepts of Newtonian Mechanics and work-energy theorem to physical systems	PSO1	Ap	C, P
CO3	Student will be able to understand and apply the rotational dynamics of rigid bodies	PSO1	Ap	C, P
CO4	Understand the basic ideas of elasticity	PSO1	U	C,P

Abbreviations used:

CL – Cognitive level; **U** – understand; **Ap** – apply; **An** – analyze; **C-**create; **KC** – Knowledge category; **C** – conceptual; **F** – factual; **P** – procedural

Semester 2 - Core Course II

PHY2B02: MECHANICS

36 hours (Credit - 2)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the features of non-inertial systems and fictitious forces	PSO1	U	C
CO2	Student will be able to understand and analyze the features of central forces with respect to planetary motion	PSO1	An	C, P
CO3	Student will be able to understand and analyze the basics ideas of harmonic oscillations and wave motion	PSO1	U	C, P

Semester 3 - Core Course III

PHY3B03: ELECTRODYNAMICS I

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the fundamentals of vector calculus	PSO1	U	C
CO2	Student will be able to understand and analyze the electrostatic properties of physical systems and the mechanism of electric field in matter	PSO1	U, An	C , P
CO3	Student will be able to understand and analyze the magnetic properties of physical systems	PSO1	U, An	C, P

Semester 4 - Core Course IV

PHY4B04: ELECTRODYNAMICS II

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the basic concepts of electrodynamics	PSO1	U	C
CO2	Will be able to understand and analyze the properties of electromagnetic waves	PSO1	An	C, P
CO3	Student will be able to understand the behavior of transient currents	PSO1	U	C
CO4	Student will be able to understand the basic aspects of ac circuits and apply electrical network theorems to circuits	PSO1	U, An	C, P

Semester 5 – Core Course –VI

PHY5B06: COMPUTATIONAL PHYSICS

54 hours (Credit – 3)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the Basics of Python programming and will acquire skills in writing and executing simple programs .	PSO4	U, Ap	C
CO2	Student will be able to understand the applications of Python modules	PSO4	U	C
CO3	Student will be able to understand the basic techniques of numerical analysis and apply to physical systems	PSO4	U, Ap	C

Semester 5- Core Course –VII

PHY5B07: QUANTUM MECHANICS

54 hours (Credit – 3

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the particle and wave properties of electromagnetic radiation	PSO2	U	C
CO2	Student will be able to understand the Rutherford – Bohr model of the atom	PSO2	U	C
CO3	Student will be able to understand and apply the Schrödinger equation to simple physical systems and apply the principle of wave mechanics to the Hydrogen atom	PSO2	Ap	C, P

Semester 5 - Core Course VIII

PH5B08: OPTICS

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC

CO1	Student will be able to understand the fundamentals of Fermat's principles and geometrical optics	PSO2	U	C
CO2	Student will be able to understand and apply the basic ideas of interference and diffraction of light	PSO2	Ap	C, P
CO3	Student will be able to understand and apply the basic ideas of polarization of light	PSO2	U, Ap	C
CO4	Student will be able to describe the basic principles of holography and fibre optics	PSO2	U	C

Semester 5 – Core Course –IX

PHY5B09: ELECTRONICS (ANALOG & DIGITAL)

54 hours (Credit – 3)

	Course Outcome	**PSO**	**CL**	**KC**
CO1	Student will be able to understand the basic principles of rectifiers and dc power supplies	PSO3	U	C
CO2	Student will be able to understand the principle and working of transistors and will be able to design transistor amplifiers and oscillators	PSO3	U, Ap	C, P
CO3	Student will be able to understand the basic operation of Op –Amp and its applications	PSO3	U	C
CO4	Student will be able to understand the basics of digital electronics	PSO3	U	C

Semester 6 - Core Course X

PHY6B10: THERMODYNAMICS

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the zero , first and second laws of Thermodynamics and applications	PSO2	U	C
CO2	Will be able to understand the thermodynamics description of the ideal gas	PSO2	U	C
CO3	Student will be able to understand the basic ideas of entropy	PSO2	U	C
CO4	Student will be able to understand and analyze the concepts of thermodynamic potentials and phase transitions	PSO2	Az	C

Semester 6 – Core Course XI

PHY6B11: STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY &PHOTONICS

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Student will be able to understand the basic principles of statistical physics and its applications	PSO2	U	C
CO2	Will be able to understand the basic aspects of crystallography in solid state physics	PSO2	U	C
CO3	Student will be able to understand the basics ideas of microwave and infra red spectroscopy	PSO2	U	C
CO4	Student will be able to understand the fundamental ideas and applications of photonics	PSO2	U	C

Semester 6 – Core Course XII

PHY6B12: NUCLEAR PHYSICS AND PARTICLE PHYSICS

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Understand the basic aspects of nuclear structure and fundamentals of radioactivity	PSO2	U	C
CO2	Describe the different types of nuclear reactions and their applications	PSO2	U	C, P
CO3	Understand the principle and working of particle detectors	PSO2	U	C, P
CO4	Describe the principle and working of particle accelerators	PSO2	U	C, P
CO5	Understand the basic principles of elementary particle physics	PSO2	U	C

Semester 6 - Core Course XIII

PHY6B13: RELATIVISTIC MECHANICS AND ASTROPHYSICS

54 hours (Credit - 3)

	Course Outcome	PSO	CL	KC
CO1	Understand the fundamental ideas of special relativity	PSO2	U	C
CO2	Understand the basic concepts of general relativity and cosmology	PSO2	U	C
CO3	Understand the basic techniques used in Astronomy	PSO2	U	C
CO4	Describe the evolution and death of stars	PSO2	U	C
CO5	Describe the structure and classification of Galaxies	PSO2	U	C

Semester 6 | - Core Course XIV (Elective)

PHY6B14 (EL1): BIOMEDICAL PHYSICS

54 hours (Credit - 3)

	Course Outcome	CL	KC
CO1	Understand the basic principles of Biophysics	U	C
CO2	Understand the fundamentals of medical Instrumentation	U	C
CO3	Understand the principles of ultrasound And x-ray imaging	U	C
CO4	Understand the basic principles of NMR	U	C
CO5	Describe the applications of lasers in Medicine	U	C

Semester 6 - Core Course XIV (Elective)

PHY6B14 (EL2): NANOSCIENCE AND TECHNOLOGY

54 hours (Credit - 3)

	Course Outcome	CL	KC
CO1	Understand the elementary concepts of nanoscience	U	C
CO2	Understand the electrical transport mechanisms in nanostructures	U	C
CO3	Understand the applications of quantum mechanics in nanoscience	U	C
CO4	Understand the fabrication and characterization techniques of nano materials	U	C
CO5	Enumerate the different applications of nanotechnology	U	C

Semester 6 - Core Course XIV (Elective)

PHY6B14 (EL3): MATERIALS SCIENCE

54 hours (Credit - 3)

	Course Outcome	CL	KC
CO1	Understand the basic ideas of bonding in materials	U	C
CO2	Describe crystalline and non crystalline materials	U	C
CO3	Understand the types of imperfections and diffusion mechanisms in solids	U	C
CO4	Describe the different properties of ceramics and polymers	U	C
CO5	Describe the different types of material analysis techniques	U	C

Semesters 1 to 4 - Core Course V

PHY4B05: PRACTICAL - I

36 hours in each semester (Credit - 5)

	Course Outcome	CL	KC
CO1	Apply and illustrate the concepts of properties of matter through experiments	Ap	P
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments	Ap	P
CO3	Apply and illustrate the concepts of optics through experiments	Ap	P
CO4	Apply and illustrate the principles of electronics through experiments	Ap	P

Semesters 5-6 - Core Course XV

PHY6B15: PRACTICAL - II

72 hours in each semester (Credit - 5)

	Course Outcome	CL	KC
CO1	Apply and illustrate the concepts of properties of matter through experiments	Ap	P
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments	Ap	P
CO3	Apply and illustrate the concepts of optics and spectroscopy through experiments	Ap	P
CO4	Apply and illustrate the principles of heat through experiments	Ap	P

Semester 5-6 - Core Course XVI

PHY6B16: PRACTICAL - III

72 hours in each semester (Credit - 5)

	Course Outcome	CL	KC
CO1	Apply and illustrate the principles of semiconductor diode and transistor through experiments	Ap	P
CO2	Apply and illustrate the principles of transistor amplifier and oscillator through experiments	Ap	P
CO3	Apply and illustrate the principles of digital electronics through experiments	Ap	P
CO4	Analyze and apply computational techniques in Python programming	Ap	P

Semester 5-6 - Core Course XVII

Course: PHY6B17(P) – PROJECT

36 hours in each semester (Credits: 2)

	Course Outcome	CL	KC
CO1	Understand research methodology	U	P
CO2	Understand and formulate a research project	C	P
CO3	Design and implement a research project	C	P
CO4	Identify and enumerate the scope and limitations of a research project	C	P

Semester 5-6 - Core Course XVII

PHY6B17(R): RESEARCH METHODOLOGY (In lieu of Project)

36 hours in each semester (Credits: 2)

	Course Outcome	CL	KC
CO1	Understand research methodology	U	C, P
CO2	Understand the concept of measurement in research	C	C, P
CO3	Understand the significance and limitations of experimentation in research	C	C,P
CO4	Understand and formulate a research project, ethics and responsibility of scientific research	C	C,P

Semester 5 – Open Course I

PHY5D01(1): NON CONVENTIONAL ENERGY SOURCES

54 hours (Credit – 3)

	Course Outcome	CL	KC
CO1	Understand the importance of non conventional energy sources	U	C
CO2	Understand basic aspects of solar energy	U	C
CO3	Understand basic principles of wind energy conversion	U	C
CO4	Understand the basic ideas of geothermal and biomass energy and recognize their merits and demerits	U	C
CO5	Understand the basic ideas of oceans and chemical energy resources and recognize their merits and demerits	U	C

Semester 5 – Open Course I

PHY5D01(2): AMATEUR ASTRONOMY AND ASTROPHYSICS

54 hours (Credit – 3)

	Course Outcome	CL	KC
CO1	Describe the history and nature of astronomy as a science	U	C
CO2	Understand the motion of earth in space and the cause of seasons	U	C
CO3	Understand the basic elements of solar system	U	C
CO4	Understand the elementary concepts of solar system	U	C

Semester - Open Course I

PHY5D01(3): ELEMENTARY MEDICAL PHYSICS

54 hours (Credit – 3)

	Course Outcome	CL	KC
CO1	Understand the basic aspects of physics of nuclear medicine	U	C
CO2	Recognize different bioelectric signals and their instrumentation	U	C
CO3	Understand the basic elements of X-ray Imaging	U	C

CO4	Understand the basic elements of ultrasound imaging and its advantages and disadvantages	U	C

Semester 1 – Complementary course-I

PHY1C01: Properties of matter & Thermodynamics

36 hours (Credit - 2)

	Course Outcome	CL	KC
CO1	Understand the basic principles of elasticity	U	C
CO2	Understand the concepts of surface tension	U	C
CO3	Understand the concepts of surface tension	U	C
CO4	Understand the basic principles of thermodynamics	U	C

Semester 2 - Complementary Course II

PHY2C02: Optics, Laser & Electronics

36 hours (Credit - 2)

	Course Outcome	CL	KC
CO1	Understand the basic concepts of interference and diffraction	U	C
CO2	Understand the concepts of polarization	U	C
CO3	Understand the fundamentals of electronics	U	C
CO4	Understand the important principles of laser physics	U	C

Semester 3 - Complementary Course III

PHY3C03: Mechanics, Relativity, Waves and Oscillations

54 hours (Credit - 3)

	Course Outcome	CL	KC
CO1	Understand the basic ideas of frames of reference and the principles of conservation of energy and momentum	U	C
CO2	Understand the concepts of relativity	U	C
CO3	Understand the basic ideas of oscillations and waves	U	C
CO4	Understand the basic ideas of modern physics	U	C

Semester 4 - Complementary Course IV

PHY4C04: Electricity, Magnetism and Nuclear physics

54 hours (Credit - 3)

	Course Outcome	CL	KC
CO1	Understand the basic ideas of static and current electricity	U	C
CO2	Understand the concepts of magnetism	U	C
CO3	Describe the fundamental concepts of nuclear physics	U	C
CO4	Understand the basic ideas of cosmic rays and elementary particles	U	C

Semester 1 to 4 - Complementary Course V

PHY4C05: PHYSICS PRACTICAL I

36 hours in each semester × 4 (Credit - 5)

	Course Outcome	CL	KC
CO1	Apply and illustrate the concepts of properties of matter through experiments	Ap	P

CO2	Apply and illustrate the concepts of electricity and magnetism through experiments	Ap	P
CO3	Apply and illustrate the concepts of optics through experiments	Ap	P
CO4	Apply and illustrate the principles of electronics through experiments	Ap	P

PHY1C01-Classical Mechanics

	Course Outcome
CO1	Student will be able to understand the features of generalized coordinates
CO2	Student will be understand the classical background of quantum mechanics
CO3	Student will be analyze Kinematics and Dynamics of Rigid Bodies
CO4	Student will be understand oscillations and Nonlinear oscillations

PHY1C02- Mathematical Physics – I

	Course Outcome
CO1	Student will be able to understand the Detailed features of vectors,matrices and tensors
CO2	Student will be able to analyze differential equations and special functions
CO3	Student will be able to apply the Fourier series in physics

PHY1C03-Electrodynamics and Plasma Physics

	Course Outcome
CO1	Student will be able to understand the features of Time varying fields and Maxwell's equations.
CO2	Student will be understand the Plane electromagnetic waves, Transmission lines, Wave guides and cavity resonators
CO3	Student will be able to analyze Relativistic electrodynamics,
CO4	Student will be understand Plasma Physics

PHY1C04- Electronics

	Course Outcome
CO1	Student will be able to understand the construction and working of FET &MOSFET
CO2	Student will be able to understand the principle and working of micro photonic devices.
CO3	Student will be able to understand the basic operation of Op –Amp and its applications
CO4	Student will be able to understand the basics of digital electronics and its application

PHY2C05-Quantum Mechanics –I

	Course Outcome
CO1	Student will be able to understand the Formulation of Quantum Mechanics&Modern quantum mechanics
CO2	Student will be able to understand the Theory of Angular Momentum
CO3	Student will be able to understand the Invariance Principles and Conservation Laws

PHY2C06- Mathematical Physics

	Course Outcome
CO1	Student will be able to understand the Detailed features of Functions of Complex Variables, Group Theory
CO2	Student will be able to analyze Calculus of Variations
CO3	Student will be able to understand the Integral equations & Green's function

PHY2C07- Statistical Mechanics

	Course Outcome
CO1	Student will be able to understand The Statistical Basis of thermodynamics
CO2	Student will be able to analyze Microcanonical, Canonical and Grand Canonical Ensembles
CO3	Student will be able to understand Formulation of Quantum Statistics
CO4	Student will be able to understand the difference between Ideal Bose Systems & Ideal Fermi Systems

PHY2C08- Computational Physics

	Course Outcome
CO1	**Student will be able to understand the Basics of Python programming and will acquire skills in writing and executing simple programs .**
CO2	**Student will be able to understand the applications of Python modules**
CO3	**Student will be able to understand the basic techniques of numerical analysis and apply to physical systems**

PHY1L01-General Physics Practical

	Course Outcome
CO1	Apply and illustrate the concepts of properties of matter through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics through experiments
CO4	Apply and illustrate the principles of electronics through experiments

PHY1L02-Electronics Practical

	Course Outcome
CO1	Apply and illustrate the principles of Opamp for mathematical operations through experiments
CO2	Apply and illustrate the principles of transistor amplifier through experiments
CO3	Apply and illustrate the principles of digital electronics through experiments

PHY3C09-Quantum Mechanics –II

	Course Outcome

CO1	Student will be able to understand the Time-Independent Perturbation Theory&Time-dependent perturbation theory
CO2	Student will be able to understand the Variational Method and WKB Method
CO3	Student will be able to understand the Relativistic Quantum Mechanics & Scattering

PHY3C10-Nuclear and Particle Physics

	Course Outcome
CO1	Understand the basic aspects of nuclear structure and fundamentals of radioactivity
CO2	Describe the different types of nuclear reactions and their applications
CO3	Understand the principle and working of particle detectors
CO4	Describe the principle of Nuclear electronics
CO5	Understand the basic principles of elementary particle physics

PHY3C11-Solid State Physics

	Course Outcome
CO1	Will be able to understand the basic aspects of crystallography in solid state physics
CO2	Understand the phenomena of Lattice Vibrations,
CO3	Understand the Properties of Semiconductors
CO4	Describe the Dielectric, Ferroelectric and magnetic properties
CO5	Describe the phenomena of Superconductivity

PHY3E05- Experimental Techniques

	Course Outcome
CO1	Student will be able to understand the theory of Vacuum Techniques, Thin film techniques and Accelerator techniques
CO2	Student will be able to analyze materials by nuclear techniques.
CO3	Student will be able to apply X-ray diffraction technique for studying crystal structure

PHY3L05-Modern Physics Practical

	Course Outcome
CO1	Apply and illustrate the concepts of Modern Physics through experiments
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments
CO3	Apply and illustrate the concepts of optics through experiments
CO4	Apply and illustrate the use of G.M counter experiments

Physics Practical PHY4L07-Computational

	Course Outcome
CO1	Student will be able to Apply the Basics of Python programming and will acquire skills in writing and executing simple programs .
CO2	Student will be able to understand the basic techniques of numerical analysis and
CO3	Student will be able to apply python programs to physical systems

PHY4C12-Atomic and Molecular Spectroscopy

	Course Outcome
CO1	Student will be able to understand the basics ideas of microwave and infra red spectroscopy
CO2	Student will be able to analyze molecules by Electronic Spectroscopy.
CO3	Student will be able to understand the basics ideas of Raman Spectroscopy.

PHY4E13- Laser Systems, Optical Fibres and Applications

	Course Outcome
CO1	Student will be able to understand the basics laser theory.
CO2	Student will be able to understand the concept of Non linear optics.
CO3	Student will be able to understand the application of laser.
CO4	Student will be able to understand the basics Optic Fibre.

PHY4E20: MICROPROCESSORS, MICROCONTROLLERS AND APPLICATIONS

	Course Outcome
CO1	Student will be able to understand the basics Microprocessor.
CO2	Student will be able to understand the Timing and control unit of a computer.
CO3	Student will be able to understand the Assembly Language Programe.
CO4	Student will be able to Apply the Assembly Language Programe for mathematical problems and in physical systems.
CO5	Student will be able to understand the basics Microcontroller and its programming

PHY4P01- Project

	Course Outcome
CO1	Understand research methodology
CO2	Understand and formulate a research project
CO3	Design and implement a research project
CO4	Identify and enumerate the scope and limitations of a research project