PROGRAMME: B.Sc. PHYSICS

Programme Outcome:

PO1: Understand the basic concepts of methodology of science and the fundamentals of physical sciences

PO2: Obtain problem solving and analytical skills

PO3: Apply and verify theoretical concepts through laboratory experiments

PO4: Attain the ability to function in multidisciplinary domains

PO5: Establish a sound foundation for higher learning

I Programme Specific Outcomes

PSO1: Understand the basic concepts of methodology of science and the fundamentals of mechanics, properties of matter and electrodynamics

PSO2: Understand the theoretical basis of quantum mechanics, relativistic physics, nuclear physics, optics, spectroscopy, solid state physics, astrophysics, statistical physics, photonics and thermodynamics

PSO3: Understand and apply the concepts of electronics in the designing of different analog and digital circuits

PSO4: Understand the basics of computer programming and numerical analysis

PSO5: Apply and verify theoretical concepts through laboratory experiments

II Course Outcomes - Core

1. **Semester 1** : **Core Course I**
   PHY1B01: METHODOLOGY OF SCIENCE AND BASIC MECHANICS

CO1: Understand the features, methods and limitations of science

CO2: Understand and apply the basic concepts of Newtonian Mechanics to physical systems

CO3: Understand and apply the basic idea of work-energy theorem to physical systems

CO4: Understand and apply the rotational dynamics of rigid bodies

CO5: Understand the basic ideas of elasticity

2. **Semester 2 : Core Course II**
   PHY2B02: MECHANICS

CO1: Understand the features of non-inertial systems and fictitious forces

CO2: Understand and analyze the features of central forces with respect to planetary motion

CO3: Understand the basics ideas of harmonic oscillations

CO4: Understand and analyze the basics concepts of wave motion

3. **Semester 3 : Core Course III**
   PHY3B03: ELECTRODYNAMICS I

CO1: Understand and apply the fundamentals of vector calculus

CO2: Understand and analyze the electrostatic properties of physical systems

CO3: Understand the mechanism of electric field in matter.

CO4: Understand and analyze the magnetic properties of physical systems

CO5: Understand the mechanism of magnetic field in matter.

4. **Semester 4 : Core Course IV**
   PHY4B04: ELECTRODYNAMICS II

CO1: Understand the basic concepts of electrodynamics

CO2: Understand and analyze the properties of electromagnetic waves

CO3: Understand the behavior of transient currents

CO4: Understand the basic aspects of ac circuits

CO5: Understand and apply electrical network theorems

5. **Semesters 1 to 4 : Core Course V**
   PHY4B05: PRACTICAL I

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

6. **Semester 5**: **Core Course –VI**
   PHY5B06: COMPUTATIONAL PHYSICS

CO1: Understand the Basics of Python programming

CO2: Understand the applications of Python modules

CO3: Understand the basic techniques of numerical analysis

CO4: Understand and apply computational techniques to physical problems

7. **Semester 5**: **Core Course –VII**
   PHY5B07: QUANTUM MECHANICS

CO1: Understand the particle properties of electromagnetic radiation

CO2: Describe Rutherford – Bohr model of the atom

CO3: Understand the wavelike properties of particles

CO4: Understand and apply the Schrödinger equation to simple physical systems

CO5: Apply the principles of wave mechanics to the Hydrogen atom

8. **Semester 5 :Core Course - VIII**
   PH5B08: OPTICS

CO1: Understand the fundamentals of Fermat's principles and geometrical optics

CO2: Understand and apply the basic ideas of interference of light

CO3: Understand and apply the basic ideas of diffraction of light

CO4: Understand the basics ideas of polarization of light

CO5: Describe the basic principles of holography and fibre optics

9. **Semester 5**: **Core Course –IX**
   PHY5B09: ELECTRONICS (ANALOG & DIGITAL)

CO1: Understand the basic principles of rectifiers and dc power supplies

CO2: Understand the principles of transistor

CO3: Understand the working and designing of transistor amplifiers and oscillators

CO4: Understand the basic operation of Op –Amp and its applications

CO5 Understand the basics of digital electronics

10. Semester 6 : Core Course X
PHY6B10: THERMODYNAMICS

CO1: Understand the zero and first laws of thermodynamics

CO2: Understand the thermodynamics description of the ideal gas

CO3: Understand the second law of thermodynamics and its applications

CO4: Understand the basic ideas of entropy

CO5: Understand the concepts of thermodynamic potentials and phase transitions

11. Semester 6 : Core Course XI
PHY6B11: STATISTICAL PHYSICS, SOLID STATE PHYSICS, SPECTROSCOPY & PHOTONICS

CO1: Understand the basic principles of statistical physics and its applications

CO2: Understand the basic aspects of crystallography in solid state physics

CO3: Understand the basic elements of spectroscopy

CO4: Understand the basics ideas of microwave and infra red spectroscopy

CO5: Understand the fundamental ideas of photonics

12. Semester 6 : **Core Course XII**
PHY6B12: NUCLEAR PHYSICS AND PARTICLE PHYSICS

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 and working of particle accelerators

CO5: Understand the basic principles of elementary particle physics

13. Semester 6 : Core Course XIII
PHY6B13: RELATIVISTIC MECHANICS AND ASTROPHYSICS

CO1: Understand the fundamental ideas of special relativity

CO2: Understand the basic concepts of general relativity and cosmology

CO3: Understand the basic techniques used in astronomy

CO4: Describe the evolution and death of stars

CO5: Describe the structure and classification of galaxies

14. Semester 6 : Core Course XIV (Elective)

PHY6B14 (EL1): BIOMEDICAL PHYSICS

CO1: Understand the basic principles of biophysics

CO2: Understand the fundamentals of medical instrumentation

CO3: Understand the principles of ultrasound and x-ray imaging

CO4: Understand the basic principles of NMR

CO5: Describe the applications of lasers in medicine

PHY6B14 (EL2): NANOSCIENCE AND TECHNOLOGY

CO1: Understand the elementary concepts of nanoscience

CO2: Understand the electrical transport mechanisms in nanostructures

CO3: Understand the applications of quantum mechanics in nanoscience

CO4: Understand the fabrication and characterization techniques of nanomaterials

CO5: Enumerate the different applications of nanotechnology

PHY6B14 (EL3): MATERIALS SCIENCE

CO1: Understand the basic ideas of bonding in materials

CO2: Describe crystalline and non crystalline materials

CO3: Understand the types of imperfections and diffusion mechanisms in solids

CO4: Describe the different properties of ceramics and polymers

CO5: Describe the different types of material analysis techniques

15. Semesters 5-6 - Core Course XV
PHY6B15: PRACTICAL II

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 and spectroscopy through experiments

CO4: Apply and illustrate the principles of heat through experiments

16. Semester 5-6 - Core Course XVI
PHY6B16: PRACTICAL III

CO1: Apply and illustrate the principles of semiconductor diode and transistor through experiments

CO2: Apply and illustrate the principles of transistor amplifier and oscillator through experiments

CO3: Apply and illustrate the principles of digital electronics through experiments

CO4: Analyze and apply computational techniques in Python programming

17. Semester 5-6 : Core Course XVII
PHY6B17(P) – PROJECT

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

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

CO1: Understand research methodology

CO2: Understand the concept of measurement in research

CO3: Understand the significance and limitations of experimentation in research

CO4: Understand and formulate a research project, ethics and responsibility of scientific research

III Course Outcomes – Open Course

1. **Semester 5 - Open Course I**
PHY5D01(1): NON CONVENTIONAL ENERGY SOURCES

CO1: Understand the importance of nonconventional energy sources

CO2: Understand basic aspects of solar energy

CO3: Understand basic principles of wind energy conversion

CO4: Understand the basic ideas of geothermal and biomass energy and recognize their

merits and demerits

CO4: Understand the basic ideas of oceans and chemical energy resources and recognize their merits and demerits

IV Course Outcomes – Complementary

1. **Semester 1**: **Complementary course-I**
   PHY1C01: Properties of matter & Thermodynamics

CO1: Understand the basic principles of elasticity

CO2: Understand the concepts of surface tension

CO3: Understand the aspects of viscosity

CO4: Understand the basic principles of thermodynamics

2. **Semester 2 : Complementary Course II**
   PHY2C02: Optics, Laser & Electronics

CO1: Understand the basic concepts of interference and diffraction

CO2: Understand the concepts of polarization

CO3: Understand the fundamentals of electronics

CO4: Understand the important principles of laser physics

3. **Semester 3 : Complementary Course III**
   PHY3C03: Mechanics, Relativity, Waves and Oscillations

CO1: Understand the basic ideas of frames of reference and the principles of conservation of energy and momentum

CO2: Understand the concepts of relativity

CO3: Understand the basic ideas of oscillations and waves

CO4: Understand the basic ideas of modern physics

4. **Semester 4 : Complementary Course IV**
   PHY4C04: Electricity, Magnetism and Nuclear physics

CO1: Understand the basic ideas of static and current electricity

CO2: Understand the concepts of magnetism

CO3: Describe the fundamental concepts of nuclear physics

CO4: Understand the basic ideas of cosmic rays and elementary particles

5. **Semester 1 to 4 : Complementary Course V**
   PHY4C05: PHYSICS PRACTICAL I

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