

## COURSE OUTCOMES

### CORE COURSES

#### Semester-I

##### PH1CRT01: METHODOLOGY AND PERSPECTIVES OF PHYSICS

On successful completion of the course, the students will be able to

- CO1 – **Construct** the insight of the Development of physics in the last century and **list out** the contributions of great scientists.
- CO2 - **Compare and contrast** the Contributions of Indian physicists.
- CO3 - **Identify** basic concepts, theories and principles and its applications of physics in everyday life.
- CO4 - *Use* the operations with basic number systems and **identify** its applications in digital electronics.
- CO5 - **Construct** the idea of application of vectors in physics and **illustrate** it with examples.
- CO6 - **Examine and describe** Experimental methods and error analysis.

#### Semester-II

##### PH2CRT02: MECHANICS AND PROPERTIES OF MATTER

On successful completion of the course, the students will be able to

- CO1 **Describe** the concept of wave motion and able to **construct** different models describing wave motion.
- CO2 **Analyse** different phenomena associated with wave motion.
- CO3 **Explain** oscillatory motion and **design** and **classify** different oscillators.
- CO4 *Explain different terms associated with rotational mechanics and obtain solutions to physical problems of rotational mechanics.*
- CO5 - **Construct** an idea of properties of solids and **illustrate** use of material with their properties.
- CO6 - **Construct** an idea of properties of liquids and **explain** different phenomena associated with it.

### Semester-III

#### PH3CRT03: OPTICS, LASER AND FIBER OPTICS

On successful completion of the course, the students will be able to

- CO1**      **Discuss** the interference phenomenon and **explain** the significance of it by **illustrating** examples.
- CO2**      **Resolving** numerical examples of interference in different context.
- CO3**      **List out** different types of diffraction and **categorise** various physical problems of diffraction.
- CO4**      **Explain** the concept of polarization and **describe** various theorems of it.
- CO5**      **Design** and **illustrate** Polaroids and **find** the applications of it.
- CO6**      **Explain** the working of laser and **compare** different types of lasers. **Predict** the applications of lasers including working of optical fiber.

### Semester-IV

#### PH4CRT04: SEMICONDUCTOR PHYSICS

On successful completion of the course, the students will be able to

- CO1**      **Describe** the properties of materials and **application** of semiconductor electronics
- CO2**      **Apply** the knowledge of semiconductors to **illustrate** the functioning of basic electronic devices.
- CO3**      **Demonstrate** the switching and amplification application of the semiconductor devices.
- CO4**      **Demonstrate** the control applications using semiconductor devices.
- CO5**      **Identify** the fabrication methods of integrated circuits.
- CO6**      **Classify** and **describe** the semiconductor devices for special applications.

### SEMESTER V

#### PH5CRT05: ELECTRICITY AND ELECTRODYNAMICS

- CO1**      Discuss the theory of moving coil ballistic galvanometer.
- CO2**      Discuss variation of alternating current with time and define basic parameters and determine mean value and rms values of ac.

- CO3** Analyse LCR series circuits and LCR parallel resonant circuit
- CO4** Illustrate Superposition, Reciprocity, Thevenin's, Norton's & Maximum power transfer theorems and describe Maxwell's equations in different media.
- CO5** Explain Seebeck effect, Laws of thermo emf, Peltier effect and Thomson effect
- CO6** Apply Gauss's law in different cases: solid sphere, infinite wire, infinite plane sheet and Discuss the Propagation of electromagnetic waves in different media.

#### **PH5CRT06: CLASSICAL AND QUANTUM MECHANICS**

- CO1** Describe principle of virtual work and D'Alembert's principle
- CO2** Solve Linear Harmonic oscillator, Planetary motion and Simple Pendulum problems using Lagrange's equation of motion
- CO3** Illustrate Calculus of variations to find out Euler Lagrange's equations for shortest distance between two points, Brachistochrone problem
- CO4** Identify the limitations of classical mechanics and find the need of quantum mechanics
- CO5** Explain the time dependant Schrodinger equation for wave function and examine the Harmonic Oscillator problem in the perspective of quantum mechanics
- CO6** Discuss the historical development and origin of quantum theory and state the postulates of quantum mechanics

#### **PH5CRT07: DIGITAL ELECTRONICS AND PROGRAMMING**

- CO1** Compare Digital and analog systems, compare operators, logic symbols and truth tables of different logic gates.
- CO2** Summarize combinational and sequential logic systems
- CO3** Use Sum of product method, product of sum method for reducing Boolean expressions and solve Boolean functions using Karnaugh map.
- CO4** Compare and contrast encoders, decoders, multiplexers and demultiplexers.
- CO5** Illustrate and classify Flip-flops, Registers and Counters.
- CO6** Construct C++ programs using loops

#### **PH5CRT08: ENVIRONMENTAL PHYSICS AND HUMAN RIGHTS**

- CO1** Explain the Causes, effects and control measures of environmental pollution

- CO2** Discuss environmental ethics and various environment protection acts such as air act, water act, wildlife protection act and forest conservation act
- CO3** Categorize renewable and non-renewable energy sources
- CO4** Classify solar heat energy convertors such as solar cooker, solar still, solar dryer, solar pond and Summarize the need and characteristics of solar photovoltaic (PV) systems
- CO5** Classify three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights) and Discuss fundamental human rights in Indian Constitution
- CO6** Identify the relationship between Conservation of natural resources and human rights

### **Open Course**

#### **PH5OPT02 - Physics in Daily Life**

- CO1** Recall Fundamental and derived quantities, Units and dimensions
- CO2** Distinguish between Fundamental phenomenon of light such as reflection, refraction, diffraction, interference and scattering
- CO3** Apply the knowledge of lens in correcting defects of the eye – myopia, hypermetropia, presbyopia and astigmatism
- CO4** Develop the basic idea of Voltage and current, ohms law, Electric energy, electric power and calculation of energy
- CO5** Discuss different phases of matter and different forms of energy
- CO6** Develop idea of Universe - Planets, solar system, lunar and solar eclipses, constellations, different types of stars, Galaxies, black hole, Satellites, Artificial satellites

### **Semester-VI**

#### **PH6CRT09: THERMAL AND STATISTICAL PHYSICS**

- CO1** Apply first law of Thermodynamics to isochoric process, isobaric process and adiabatic process.
- CO2** Describe the parts of heat engines and apply Second law to explain the working of Carnot Refrigerator
- CO3** Understand the concept of entropy and change in entropy.
- CO4** Establish the relation of thermodynamic potentials with their variables.
- CO5** Understand the temperature dependence of black body radiation.

**CO6** Discuss the need for quantum statistics to derive Bose – Einstein and Fermi – Dirac distribution laws and find application of B- E and F- D statistics.

### **PH6CRT10: RELATIVITY AND SPECTROSCOPY**

**CO1** Extend the Lorentz transformation to concepts of Length contraction, time dilation and relativistic Mass.

**CO2** Outline the introductory concepts of general theory of relativity.

**CO3** Describe Vector Atom model and discuss Zeeman Effect

**CO4** Summarize the principle of Nuclear magnetic Resonance (NMR) and of Electron spin resonance (ESR)

**CO5** Examine the Rotational and Vibrational Spectra of diatomic molecules

**CO6** Compare and explain IR, Microwave and Raman Scattering spectroscopes

### **PH6CRT11: NUCLEAR, PARTICLE PHYSICS AND ASTROPHYSICS**

**CO1** Illustrate General properties of nucleus and classify Models of Nuclear structure

**CO2** Compare and explain Nuclear Radiation Detectors, Counters and Particle Accelerators

**CO3** Describe Gamow's theory of  $\alpha$  decay and explain the working of Nuclear fission and Nuclear fusion reactors

**CO4** Classify elementary particles and instantiate the quark model of elementary particles

**CO5** Distinguish Latitude effect, Azimuth effect and Altitude effect of cosmic rays

**CO6** Illustrate stellar evolution and classify different types of stars

### **PH6CRT12: SOLID STATE PHYSICS**

**CO1** Define the fundamental terms needed to study the structure of a crystal and distinguish the different crystal structures with examples.

**CO2** Discuss the classical and quantum theories of free electron model.

**CO3** Discuss band theory qualitatively using Kronig – Penney model.

**CO4** Explain the phenomenon of superconductivity and discuss the fundamental properties of superconductors.

**CO5** Define Josephson effect and discuss how it is used in SQUIDs.

**CO6** Explain BCS theory of superconductivity qualitatively.

### **Choice Based Course**

#### **PH6CBT03: COMPUTATIONAL PHYSICS**

**CO1** Solve Nonlinear Equations by Bisection, Newton Raphson, Regula-Falsi, Secant and Fixed point iteration methods

**CO2** Solve system of linear algebraic equations by Gauss elimination method, Gauss-Jordan method Factorization and Iterative methods

**CO3** Apply Regression and interpolation methods in Curve fitting

**CO4** Explain trapezoidal rule and Simpson's 1/3 and 1/8 rule for numerical integration

**CO5** Explain Euler's method and first and second order Runge-Kutta method to find the numerical solution of differential equation

**CO6** Compose and write algorithms of various computational problems

### **Physics Core Practical**

#### **SEMESTER I & II (First Year)**

##### **Core Practical 1: PH2CRP01 – Mechanics and Properties of Matter**

**On successful completion of the course, the students will be able to**

**CO1** Determine viscosity of a liquid by Variable and constant pressure head methods

**CO2** Determine the surface tension and viscosity of fluid by different experimental techniques

**CO3** Verify the expression for young's modulus by analysing bending behaviour beams

**CO4** Apply the knowledge of dynamics of different types of pendulum to determine 'g'.

**CO5-** Verify and illustrate the concept of moment of inertia and its significance.

**CO6** Determine the elastic behaviour and working of torsional pendulum.

#### **SEMESTER III & IV (Second Year)**

##### **Core Practical 02: PH4CRP02 –Optics and Semiconductor Physics**

**On successful completion of the course, the students will be able to**

**CO1 –** Determine refractive index of material of the prism and liquid by using spectrometer

- CO2** Distinguish between P-N junction diode and Zener diode.
- CO3** Demonstrate voltage regulation using Zener diode
- CO4** Determine focal length of lens and optical constants of different media.
- CO5** Illustrate the theory and experiment of interference using air wedge and newtons rings
- CO6** Construct half wave, full wave and bridge rectifiers

## **SEMESTER V & VI**

### **Core Practical :03**

#### **PH6CRP03 – Electricity, Magnetism and LASER**

- CO1** Measure resistance of wire, convert galvanometer into voltmeter and ammeter and Calibrate ammeter, low range and high range voltmeter using Potentiometer
- CO2** Find  $m$  and  $B_h$  and sketch magnetic flux variation using field along the axis of a circular coil
- CO3** Find magnetic moment of a bar magnet using Searle's vibration magnetometer
- CO4** Determine wavelength of Laser using Grating and determine slit width by Single slit diffraction using laser
- CO5** Measure resistivity of wire using Carey Foster's bridge.
- CO6** Verify Thevenin's and Norton's theorems

### **Core Practical :04**

#### **PH6CRP04 – Digital Electronics**

- CO1** Realize logic gates – AND, OR and NOT – Using diodes, transistors etc. and using universal gates
- CO2** Verification of truth table of NAND, NOR, XOR and XNOR gates and verify De Morgan's theorems – using IC 7400
- CO3** Construct and verify A/D converter using IC 741 and BCD to 7 segment decoder
- CO4** Realize Half adder using gates and verify its truth table
- CO5** Construct Astable and Monostable Multivibrator using Transistor and IC 555
- CO6** Construct SR and JK Flip Flops using IC 7400 & 7410 and verify truth table

### **Core Practical :05**

#### **PH6CRP05 – Thermal Physics, Spectroscopy and C++ Programming**

- CO1** Use Thermistor and Carey Foster's bridge to find Temperature coefficient of resistance
- CO2** Write and execute Computer programming in C++ to generate Fibonacci series and to convert a decimal number into binary number
- CO3** Write and execute Computer programming in C++ to Solve a quadratic equation and for sorting the numbers in ascending and descending order
- CO4** Calculate 'g' from experimental data of Simple Pendulum using Computer programming in C++
- CO5** Write and execute Computer programming in C++ to Convert temperature scale
- CO6** Find Dispersive power and Resolving power of grating and prism using Spectrometer and find Cauchy's constants

### **Core Practical :06**

#### **PH6CRP06 – Acoustics, Photonics and Advanced Semiconductor Physics**

- CO1** Use Sonometer to Determine frequency of AC
- CO2** Determine frequency of given tuning fork, unknown mass and verification of laws of strings using sonometer and Melde's string
- CO3** Measure and draw V- I characteristics of solar cell and different colours of LED
- CO4** Construct and study Weinbridge Oscillator using IC 741 and Pulse Width Modulator using IC 555
- CO5** Construct Regulated power supply using Zener diode and IC 741 and study line and load regulations
- CO6** Construct and study Voltage multipliers – Doubler & Tripler

#### **PH6PRO01 – Project and Industrial Visit**

- CO1** Identify the need of lifelong learning and adapt to changing needs of profession and society and get updated with current state-of-art
- CO2** Express ideas clearly and effectively, both verbally and in written form.
- CO3** Find links across different areas of knowledge and generate, develop and evaluate ideas and information related to the project.



**CO4** Develops ability to work with peers, building teamwork and group skills.

**CO5** Inspect and realize practical working environment and industrial practices.