



**DEPARTMENT OF PHYSICS**  
**INDAS MAHAVIDYALAYA**

**PROGRAM COURSE**  
**PROGRAMME OUTCOME**

**PO1.** Upon completion of Course students will be able to obtain a core knowledge in different branches of Physics, i.e., vector analysis, classical mechanics, electricity and magnetism, quantum mechanics, electronics, optics, special theory of relativity and modern physics, physics of the earth, radiation safety.

**PO2.** After completing the Course students are also expected to develop an ability to communicate physics-related topics both orally and in writing

**PO3.** Students will learn how to design and conduct an experiment (or series of experiments). Additionally, they should be familiar with the analytical methods required to interpret and analyse results and develop conclusions as supported by their data.

**PO4.** Students will be able to develop the proficiency in the acquisition of data with the help of different types of laboratory instruments and in the analysis and interpretation of such data.

**PO5.** Upon completion of Course students will be able to develop an understanding of the impact of physics on society.

**PO6.** Upon completion of Course students will learn to apply conceptual understanding of the physics to general real-world conditions.

**PO7.** Upon completion of Course students will learn to describe the methodology of science and the relationship between observation and theory.

**PO8.** Upon completion of Course students should learn to identify the limitations of equipment and also learn to minimize contributing variables

**PO9.** Upon completion of Course students will be able to discover applications of physics ideas in the fields of other sciences and engineering.

**PO10.** Upon completion of Course students are expected to analyse physical problems and generate correct solutions with the help of natural laws.

**PO11.** Analyse physical problems and develop correct solutions using natural laws.

## **Course Outcomes**

### **Semester-1**

#### **SP/PHS/101/C-1A**

#### **Course Title: Physics -I**

**CO1.** Upon completion of course students will be able to develop the concepts of vector and basic knowledge of the vector differential operator Del and understand the operation on the scalar and vector field.

**CO2.** Upon completion of course students will Learn and realize about vector theorems like Divergence and Green theorem etc.

**CO3.** Student will develop the concepts on classical mechanics and enhance the basic knowledge of the non-inertial and inertial frame of reference, variable mass, rocket motion, special theory of relativity.

**CO4.** They will acquire knowledge about the elasticity of the material and the streamline and turbulent motion.

**CO5.** Enhance the capability to prepare and organize a presentation on the application of fundamental dynamics.

**CO6.** They can understand the relation between electrical charge, electrical field and electrical potential

**CO7.** They can understand and realize the superposition of SHM collinearly and perpendicularly and can study the Beat and Lissajous figures.

**CO8.** Student are able to Know the vocabulary and concepts of physics as it applies to: Principles of Electric Fields, Gauss's Law, Electric Potential, Capacitance and Dielectrics, Current and Resistance, Direct Current Circuits, Magnetic Fields, Sources of Magnetic Fields, Faraday's law, inductance, AC circuit and electromagnetic waves.

#### **Physics 1 Lab**

**CO1.** Student will learn how can use the screw gauge, slide callipers, microscope, telescope.

**CO2.** They are able know how experimentally measure the Young's modulus, coefficient of viscosity of liquid, acceleration due to gravity, spring constant.

**CO3.** They will acquire knowledge about Lissajous figures, coupled oscillations.

**CO4.** They can realize about the moment of inertia of body about the axis of rotation.

### **Semester-2**

#### **SP/PHS/201/C-1B**

#### **Course Title: Physics II**

**CO1.** Students will be able to describe Biotsavart law, Ampere's law and its application also. Students will be able to develop idea about magnetic properties of material, magnetic induction, magnetic susceptibility. Students will be able to develop knowledge about the pointing vector, Faraday law of induction.

**CO2.** They are able to use electromagnetic theory and principles in a wide range of applications.

**CO3.** They will develop skill to solve the problems analytically and numerically.

**CO4.** Students will be able to describe Maxwell equations.

**CO5.** They will know about the kinetic of gases, zeroth law of thermodynamics, 1st and 2nd law of thermodynamics.

**CO6.** They will gather knowledge about isothermal and adiabatic process and also learn how to solve the thermodynamic problems.

**CO7.** They will also learn about the entropy and how the entropy of the universe is changing.

**CO8.** They will understand how statistics of the microscopic world can be used to explain the thermal features of the macroscopic world.

**CO9.** Be able to use thermal and statistical principles in a wide range of applications

### **Physics-II- Lab**

**CO1.** Students will acquire knowledge about the experimental measurement of plank's constant, Stefan's constant, coefficient of thermal conductivity of a bad conductor.

**CO2.** They will learn to measure resistance, current, voltage, capacitor, inductor using multimeter.

**CO3.** They will learn to the ballistic galvanometer.

**CO4.** Learn the experimental measurement of resonant frequency of LCR circuit.

### **Semester-3**

**SP/PHS/201/C-1C**

### **Course Title: Physics III**

**CO1.** Student will develop an understanding of the principles of optics.

**CO2.** To build connections between mathematical development and conceptual understanding.

**CO3.** Develop explicit problem-solving strategies that emphasize qualitative analysis steps to describe and clarify the problem

**CO4.** They will understand the relationship between observation and theory and their use in building the basic concepts of modern physics.

**CO5.** They will understand how major concepts developed and changed over time.

**CO6.** They will be Capable of analyzing and solving problems using oral and written reasoning skills based on the concepts of modern physics.

### **Physics III Lab**

**CO1.** There is scope to learn how use spectrometer to study the spectrum of helium, sodium vapour.

**CO2.** They will acquire clear knowledge about prism, grating, single slit

**CO3.** They will learn experimentally about Newton's ring.

**CO4.** Students will also realize about the resolving power of lens.

**CO5.** They can learn to handle the travelling microscope and using this they will be able to measure the refractive index of liquid.

**CO6.** They will understand about the power of the lens.

### **SEC-1**

### **Renewable Energy and Energy Harvesting**

**CO1.** Students will be able to know about the non-conventional, conventional energy source

**CO2.** They will know about the need of renewable energy source.

**CO3.** Develop the idea about tidal energy, wind energy, geothermal energy, solar energy etc.

**CO4.** They will Understand the how can utilize the effect of the piezoelectric effect.

**CO5.** They will acquire the complete knowledge about the solar pond and its importance in cold country.

**CO6.** They will know the importance of the energy harvesting.

### **Semester-4**

### **SP/PHS/201/C-1D**

### **Course Title: Physics IV**

**CO1.** Students will acquire knowledge about the active and passive circuit elements

**CO2.** Students will acquire complete knowledge and can realize about the semiconductor devices such as diode, transistors, rectifier, amplifier, Op-amp.

- CO3. They will learn to design the electronic circuit efficiently.
- CO4. They will know the process of solving the different types of transistor problems.
- CO5. They will be able to know about the combinational and sequential circuit.
- CO6. They can study the flip-flop circuit.
- CO7. They will gather huge new concept about the electronics.

### **Physics IV –Lab**

- CO1. Understand the internal structure of the logic gates.
- CO2. Able to study the truth table of all the possible logic gate.
- CO3. Learn about the transistor amplifier circuit.
- CO4. Able to study the characteristics of transistor, op-amp.
- CO5. Learn how design the amplifier circuit using transistor.

### **SEC-2**

### **Radiation Safety**

- CO1. They will understand the basic concept of the atomic structure and also know about the nuclei and about their stability.
- CO2. They will learn about interaction of nuclear particles with matter while passing through a media.
- CO3. They will acquire knowledge about the detection of nuclear radiation and about their range and depends on which factor.
- CO4. They are able to know about the application of the nuclear radiation in different medical purposes.

### **Semester-5**

### **SP/PHS/501/DSE-1A**

### **Course Title: Classical Dynamics**

- CO1. Learn the Lagrangian and Hamiltonian of a system and their applications in classical mechanics.
- CO2. Acquire a complete knowledge about the small amplitude oscillations.
- CO3. Develop the concept about the special theory of relativity and understand the four vector.

**CO4.** Able to know about the Navier-Stokes equation, qualitative description of turbulence, Reynolds number.

### **SEC-3**

#### **Electrical circuits and Network skills**

**CO1.**After the completion of the course the student will be able to acquire necessary skills/hands on experience /working knowledge on multimeters, voltmeters, ammeters, electric circuit elements, dc power sources, ac/dc generators, inductors, capacitors, transformers, single phase and three phase motors, interfacing dc/ac motors to control and measure, relays.

**CO2.** Students are expected to be developing idea about the basics of electrical wiring.

### **Semester-6**

#### **SP/PHS/501/DSE-1B**

#### **Physics of the Earth**

**CO1.** Understand about the origin of universe, creation of elements and earth.

**CO2.** Know the Holistic understanding of our dynamic planet through Astronomy, Geology, Meteorology and Oceanography.

**CO3.** Know the character of the Milky Way galaxy and also understand about the Earth's orbit and spin, the Moon's orbit and spin .

**CO4.** Know about the terrestrial and Jovian planets.

**CO5.** Develop the concept about internal structure of the earth and different dynamic processes of occur inside the earth.

**CO6.** Understand the role of the biosphere in shaping the environment

### **SEC-4**

#### **Basic Instrumentations Skills**

**CO1.** Learn about the different electronic devices.

**CO2.** Able to know about the design of the electronic circuit.

**CO3.** Can study the rectifier, amplifier, oscillator circuits.

**CO4.** Understand about the operation of transformer.

**CO5.** Develop the idea about transistor.