

## Course Outcomes

### Course I: MECHANICS, WAVES AND OSCILLATIONS

#### **Course outcomes:**

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

- *Understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.*
- *Apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.*
- *Comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.*
- *Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.*
- *Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.*
- *Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.*
- *Figure out the formation of harmonics and overtones in a stretched string and acquire the knowledge on Ultrasonic waves, their production and detection and their applications in different fields.*

#### **Course outcomes (Practical's):**

*On successful completion of this practical course, the student will be able to,*

- *Perform experiments on Properties of matter such as the determination of moduli of elasticity viz., Young's modulus, Rigidity modulus of certain materials; Surface tension of water, Coefficient of viscosity of a liquid, Moment of inertia of some regular bodies by different methods and compare the experimental values with the standard values.*
- *Know how to determine the acceleration due to gravity at a place using Compound pendulum and Simple pendulum.*
- *Notice the difference between flat resonance and sharp resonance in case of volume resonator and sonometer experiments respectively.*
- *Verify the laws of transverse vibrations in a stretched string using sonometer and comment on the relation between frequency, length and tension of a stretched string under vibration.*
- *Demonstrate the formation of stationary waves on a string in Melde's string experiment.*
- *Observe the motion of coupled oscillators and normal modes.*

## Course-II: WAVE OPTICS

### Course outcomes:

*On successful completion of this course, the student will be able to:*

- *Understand the phenomenon of interference of light and its formation in (i) Lloyd's single mirror due to division of wave front and (ii) Thin films, Newton's rings and Michelson interferometer due to division of amplitude.*
- *Distinguish between Fresnel's diffraction and Fraunhofer diffraction and observe the diffraction patterns in the case of single slit and the diffraction grating.*
- *Describe the construction and working of zone plate and make the comparison of zone plate with convex lens.*
- *Explain the various methods of production of plane, circularly and polarized light and their detection and the concept of optical activity.*
- *Comprehend the basic principle of laser, the working of He-Ne laser and Ruby lasers and their applications in different fields.*
- *Explain about the different aberrations in lenses and discuss the methods of minimizing them.*
- *Understand the basic principles of fibreoptic communication and explore the field of Holography and Nonlinear optics and their applications.*

### Course outcomes (Practical's):

*On successful completion of this practical course the student will be able to,*

- *Gain hands-on experience of using various optical instruments like spectrometer, polarimeter and making finer measurements of wavelength of light using Newton Rings experiment, diffraction grating etc.*
- *Understand the principle of working of polarimeter and the measurement of specific rotatory power of sugar solution*
- *Know the techniques involved in measuring the resolving power of telescope and dispersive power of the material of the prism.*
- *Be familiar with the determination of refractive index of liquid by Boy's method and the determination of thickness of a thin wire by wedge method.*

## Course-III: HEAT AND THERMODYNAMICS

### Course outcomes:

*On successful completion of this course, the student will be able to:*

- *Understand the basic aspects of kinetic theory of gases, Maxwell-Boltzmann distribution law, equipartition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases*
- *Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration, the concept of entropy, the thermodynamic potentials and their physical interpretations.*
- *Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency*

- Develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.
- Differentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures.
- Examine the nature of black body radiations and the basic theories.

#### **Course outcomes (Practical's):**

*On successful completion of this practical course, the student will be able to;*

- Perform some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, variation of thermo-emf of a thermocouple with temperature difference at its two junctions, calibration of a thermocouple and Specific heat of a liquid.

### **Course-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS**

#### **Course outcomes:**

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

- Understand the Gauss law and its application to obtain electric field in different cases and formulate the relationship between electric displacement vector, electric polarization, Susceptibility, Permittivity and Dielectric constant.
- Distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate circumstances.
- Understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
- Develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.
- Phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q-factor, Power factor and the comparative study of series and parallel resonant circuits.
- Describe the operation of p-n junction diodes, Zener diodes, light emitting diodes and transistors
- Understand the operation of basic logic gates and universal gates and their truth tables.

#### **Course outcomes (Practical's):**

*On successful completion of this practical course the student will be able to;*

- Measure the current sensitivity and figure of merit of a moving coil galvanometer.
- Observe the resonance condition in LCR series and parallel circuit
- Learn how a sonometer can be used to determine the frequency of AC-supply.
- Observe the variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's apparatus.
- Understand the operation of PN junction diode, Zener diode and a transistor and their V-I characteristics.
- Construct the basic logic gates, half adder and full adder and verify their truth tables. Further, the student will understand how NAND and NOR gates can be used as universal building blocks.

## Course V: MODERN PHYSICS

### Course outcomes:

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

- *Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary quantum mechanics and nuclear physics.*
- *Develop critical understanding of concept of Matter waves and Uncertainty principle.*
- *Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.*
- *Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors.*
- *Classify Elementary particles based on their mass, charge, spin, half-life and interaction.*
- *Get familiarized with the nano materials, their unique properties and applications.*
- *Increase the awareness and appreciation of superconductors and their practical applications.*

### Course outcomes (Practical's):

*On successful completion of this practical course, the student will be able to;*

- *Measure charge of an electron and e/m value of an electron by Thomson method.*
- *Understand how the Planck's constant can be determined using Photocell and LEDs.*
- *Study the absorption of  $\alpha$ -rays and  $\beta$ -rays, Range of  $\beta$ -particles and the characteristics of GM counter*
- *Determine the Energy gap of a semiconductor using thermistor and junction diode.*

### Elective Paper – VII (C) – Renewable Energy

#### Course Outcomes (theory paper)

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

- Understand energy flow from the Sun, the role of energy in the overall development of a nation.
- Enable to learn how the conventional energy sources destruct the environment.
- Supplements the awareness on global and Indian energy scenario and the need of the renewable energy sources as the future energy of the globe.
- Develops complete theoretical understanding about solar and wind energies and types and appliances.
- Awareness on the classification and production of Ocean and Hydro energy sources.
- Complete understanding about Biomass energy sources and methods along with biogas.

#### Course Outcomes (practical's paper)

On successful completion of this practical's course, the students will be able to.....

- Good understanding and knowledge about the properties of Solar cells and their characteristics.
- Able to study the characteristics of Photocells.
- To measure the efficiency of solar cooker and working of pyrometer
- Able to study the factors that influences the solar energy generation.
- Able to measure the factors of the wind energy conversion and the working of wind turbine.

**Cluster Paper – VIII (C1) – Solar thermal and Photovoltaic aspects**  
**Course Outcomes (theory paper)**

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

- Basic knowledge bot the properties and factors that influences the solar energy with proper laws and different associated phenomena.
- Complete knowledge about the extraction of solar energy with FPC-flat plate collector and its efficiency.
- Total awareness on the basics and applications of Solar Photovoltaic cell and its properties and the construction of PV systems.
- Awareness on the common application of solar thermal hot water systems, types and working.
- Understanding about the different types of fabrication of PV systems with comple knowledge about solar PV system components.

**Course Outcomes (practical's paper)**  
 On successful completion of this practical's course, the students will be able to.....

- Able to study the basic properties of solar photovoltaic panel
- Measurement of solar radiation and its constants with pyro-helimeter and nometer
- Determination of efficiency of FPC
- Able to measure the emissivity, reflectivity and transssivity.
- Erecting of solar pv systems with series and parallel combinations.

**Cluster Paper – VIII (C2) – Wind, Hydro and Ocean Energies.**

**Course Outcomes (theory paper)**

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

- Able to understand origin, meteorology, distribution of wind and classificational and working of Wind Energy Conversion Systems.

- Complete awareness on the Wind energy conversion principle and theorems and wind turbine.
- Knowledge of design and working of turbines and Study outcomes of environmental effects of wind forms.
- Good knowledge about various hydro power plants, their design and factors needed to regulate it.
- Complete knowledge about different types of Ocean energies and methods of extraction of energy from the three types.

Course Outcomes (practical's paper)

On successful completion of this practical's course, the students will be able to.....

- Determination of wind speed and characteristics of wind generator.
- Study of rotor characteristics with blade properties of wind turbine.
- To study the performance of turbine with its mode of axis.
- To measure the output power of hydroelectric generator with the variation of different properties.

**Cluster Paper – VIII (C3) – Energy Storage Devices**

Course Outcomes (theory paper)

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

- Basics of energy storage methods of chemical, thermal, photo, electro and hydrogen energy storage.
- Total awareness on the electrochemical energy storage devices and systems to the extent of advanced systems.
- Understanding of magnetic and electric energy storage systems with its applications.
- Insight study of fuel cells with basic knowledge, characteristics and performance and its indicators.
- To understand the classification of fuel cells and working to the extent of their applications.

Course Outcomes (Project Work)

On successful completion of the project work, the students will be able to.....

- Basic understanding of construction and working of an energy storage device/system

- Measurements of its generated output and verification of output with various parameters.
- To have a complete knowledge about the design and working of a project work.
- Able to understand the way of research and necessary inputs to proceed and study of stepwise moment in the research work.