

# Certificate course in Physics

## First semester

### Course No: 1 Kinematics and Dynamics

#### **Objective:**

- 1) To understand basic concept of motion and rest.
- 2) To provide a broad coverage on basic laws of physics

#### **Outcomes:**

After completing this course students will be able to

1. Understand and apply the basic concepts of Newtonian Mechanics to Physical System.
2. Relation between work and energy and its concepts
3. Understand and apply the basic idea of work-energy theorem to physical system.

#### **Course contents:**

##### **Module 1**

##### ***Kinematics – Motion in a straight line and plane. (15 hrs.)***

Graphical representation of motions – Position time graph and velocity time graph, Equation of motion, Displacement and distance, Velocity and acceleration, Vector addition – Triangular law and Parallelogram law, Uniform circular motion – Centripetal force and acceleration.

##### **Module 2**

##### ***Dynamics – Laws of motion and Work, Energy & Power. (15 hrs.)***

Newton's laws of motion, Impulse and its application, Law of conservation of momentum – Recoil of gun, Friction – Laws of static and kinetic friction, angle of repose, Methods of reducing friction. Different types of work, Kinetic and Potential energy, Power, Collision -Elastic and Inelastic collision.

***Book Recommended:***

1. An Introduction to Mechanics, 1st Edition- Daniel Kleppner and Robert J. Kolenkow- Mc GrawHill.
2. Berkeley Physics Course Vol 1: Mechanics 2nd Edtn.

**Second semester**

**Course No: 2 Semiconductor Diodes**

***Objective:***

- 1) To understand basic concept of semiconductors, Semiconductor diodes & their characteristics.
- 2) To provide a broad coverage of solid state devices
- 3) Describe the motion of free electrons & vacancies through a P N junction.
- 4) To study & verify the fundamental of P N junction diode in forward bias.
- 5) Acquire the fundamental knowledge & exposes to

***Outcomes:***

After completing this course students will be able to

- 1) Identify & understands construction & properties of P N junction diode, Zener diode, light emitting diode photodiode & varactor diode their V-I characteristics.
- 2) Become aware of the general characteristics of three important semiconductor materials.
- 3) Test semiconductor diodes range small signal diode, Zener diode

***Opportunity:***

- 1) There are many opportunities in designing & manufacturing diodes
- 2) Silicon diode in a D.C Circuit Assembly using connectors blocks.
- 3) Great strides have been made in the manufacturing techniques.

## ***Course contents:***

### ***Module 1:***

#### ***Semiconductor Diodes and DC power supplies (15 hrs.)***

- Semiconductor Diodes, Resistance of crystal diode, crystal diode equivalent circuit, crystal diode, rectifiers and filter circuits.

### ***Module 2:***

#### ***Semiconductor Diodes (15 hrs.)***

Semiconductor (Definition) type of semiconductor, P N junction diode, light emitting diode zener diode, photo diode, varactor diode & their characteristics

#### ***Book Recommended:***

- 1) Principles of Electronics, - V.K. Mehta, Rohit Mehta, S chand 11th Revised Edition 2008 New Delhi 110055
- 2) Electronics Circuit: - Hand book & design & application, U. Tietze 2008 springer.

## **Third semester**

### **Course No: 3 Lasers**

#### ***Objective:***

- 1) Lasers are ideal tools when it comes to processing materials quickly and efficiently
- 2) They can be used for cutting marking engraving, drilling & structuring purpose
- 3) High quality objective lenses and being expanders laser material processing.

#### ***Outcomes:***

- 1) Expected course outcomes upon completion of this course, the student will be cognitive level

2) Discuss the importance & fascinating area of interference with many experiment associated with it.

### ***Opportunity:***

1. Laser range finding
2. Bar code readers
3. Laser surgery
4. Holographic Imaging
5. Laser Spectroscopy
6. Laser Material Processing

### ***Course contents:***

#### ***Module 1 :***

##### ***Laser (15 hrs)***

Laser:- Introduction, properties, spontaneous & stimulated emission, theory of laser action, Einstein's coefficient light amplification, characterization, of laser beam.

#### ***Module 2 :***

##### ***Types of Laser (15 hrs)***

He-Ne laser semiconductor laser, Ruby laser, Co<sub>2</sub> Laser, N<sub>2</sub> Laser, Diode laser.

### ***Book Recommended:***

1. Laser and non laser optics B.B. Loud Willey eastern limited
2. A text book of optics : Brijlal & Subraymanyam S. Chand & Co.

## Fourth semester

### Course No: 4 Thermometry

#### ***Objective of the course:***

This course will introduce the students to the world of heat & thermodynamics & the behaviour of the physical system at different thermodynamically condition. After completing these course student will understand the difference in type of thermometer and relation between them. To have students see and understand that a thermometer is a device that use to measure a change in temperature.

#### ***Outcomes:***

The thermometer is an easy yet important to that can be used to detect changes in the temperature.

#### ***Opportunity:***

Some of the key factors propelling the market growth are growing demand for temperature monitoring devices, Health care expenses & rising healthcare awareness.

#### ***Course contents:***

##### ***Thermometry (30 hrs)***

- 1) Concept of heat & temperature, type of thermometer centigrade and Fahrenheit relation between Celsius Kelvin, Fahrenheit and Rankine Scales of temperature.
- 2) Platinum resistance thermometer, Seebeck effect, problems, liquid thermometers.
- 3) Advantage of gas thermometers, comparison of different thermometers, low & high temperature measurements.

#### ***Book Recommended:***

1. Heat & Thermodynamics: Brijlal N. Subrahmanyam, Sultan Chand & Company Ltd.
2. Heat & Thermodynamics: D.S. Mathur Sultan Chand & Company Ltd.

## **Fifth semester**

### **Course No: 5 Solar Energy**

#### ***Objective:***

- 1) Energy Saving
- 2) Solar Energy system installation
- 3) Dedicated individual educated
- 4) D.C. Solar facility
- 5) Power harness energy.

#### ***Outcomes:***

After studying this course, you should be able to

- 1) Explain the principal that underlie the ability of various natural phenomena to deliver solar energy
- 2) Out live the technologies they are used to harness the power of solar Energy

#### ***Opportunity:***

Materials engineer, Field service technician, Technical cells of photo voltaic systems, solar site assessor, Solar installer.

#### ***Course contents:***

##### ***Solar Energy (30 hrs)***

- 1) Man & energy world production & Reverses of commercial energy source, Indian's Production & reverse energy.
- 2) Alternative photovoltaic conversion world energy, energy form biomass, wave energy Ocean thermal energy conversion, energy in marine current.

3) Solar energy and harvesting Importance storage of solar energy application of solar energy, solar water heater solar distillation, Solar cooker solar cell characteristics of photovoltaic (PV) System.

***Book Recommended:***

1. Non- Conventional energy Sources: G.D. Rai Khanna Publishes, New Delhi.
2. Solar energy : M.P. Agarwal – S. Chand & co. Ltd.
3. Solar energy : Suhas P. Sukhative tat a Mc Grew hill publishing company Ltd.

**Sixth semester**

**Course No: 6 Basic Electricity Principles and Transistor Applications**

***Objective:***

- 1) Describe the composition, matter, and the structure of the atom
- 2) Describe the principles of electricity and the theory of current flow
- 3) Describe the basic type of electrical circuit and their characteristics
- 4) Describe electromagnetism
- 5) To study the input and output characteristics NPN transistor CE mode and determine transistor parameter.

***Outcomes:***

- 1) Creating new knowledge
- 2) Developing physical and manual skill

- 3) Developing feeling and emotion
- 4) Communication effectively
- 5) Acquire subjective knowledge

### ***Opportunity:***

- > Lights, water heating's and cooling's
- > T.V. and media devices
- > Smaller mechanical sensitivity
- > Low operating voltage
- > Extremely long life
- > Fast switching
- > No power consumption
- > Better efficiency circuit and lower cost and smaller in size
- > Used to develop single integrating circuit

### ***Course contents:***

#### **Module I:**

##### **Basic Electricity Principles (10 hrs)**

Resistance, inductance, capacitor, colour code, resistance, voltage, current, power, ohms law, Kirchhoff's law, junction diode transistor

#### **Module 2:**

##### **Understanding Electronic Circuit (10 hrs)**

AC and DC course, rules and analysis, DC source, electronic circuit, current voltage drops across the DC circuit elements, rectifier (half wave full wave and bridge) voltage regulator using zener diode



### **Module 3:**

#### **Transistor Application (10 hrs)**

CE amplifier, its analysis and performance, CB amplifier, its analysis and performance, Hartley oscillator, Colpits oscillator, and their performance.

#### ***Book Recommended:***

1. A Text Book In Electrical Technology, B L Thereja, S Chand, and CO.
2. Electrical Circuit Handbook Of Design And Application J T Tech, Schenk, 2008 Springer
3. Electrical Circuit Handbook Of Design And Application J T Tech, Schenk, 2008 Springer