

16HS102 ENGINEERING PHYSICS

Hours Per Week :

L	T	P	C
3	-	-	3

Total Hours :

L	T	P	WA/RA	SSH/HSB	CS	SA	S	BS
45	-	-	10	45	-	10	-	10

Course Description and Objectives:

Technology is the experimental information for the physicist, where the theories can be tested. Recent technical developments have been the results of collaboration of physicists and engineers.

Study of engineering physics is a unique opportunity to learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.

The present course deals with various fields such as Lasers, Optical fibers, Photonics, Nano and functional materials, make the students to enrich basic knowledge in various fields of physics and apply the same in engineering fields.

Course Outcomes:

The student will be able to:

- understand the applications of ultrasonics and to calculate the velocity of ultrasonic waves in liquids.
- acquire basic knowledge in Non-destructive techniques.
- understand basic concepts of laser and optical fiber which help in designing and developing new devices in emerging fields.
- grasp the basics of quantum mechanics.
- understand the fabrication of solar devices.
- use nano science and technology for innovative and compact design.
- demonstrate synthesis, properties and applications of nanomaterials and functional materials.

SKILLS:

- ✓ Determine the velocity of ultrasonics in a given liquid using interferometer.
- ✓ Study the wavelengths of light sources and lasers.
- ✓ Estimate the efficiency of a given solar cell.
- ✓ Learn about the type of the optical fiber and its ability to propagate light waves from its numerical aperture.
- ✓ Know voltage – current characteristics of a given light emitting diode.

UNIT - 1**L-9**

ULTRASONICS: Introduction, Production of ultrasonic waves - Piezoelectric method; Properties of ultrasonic waves, Types of ultrasonic waves, Determination of velocity of ultrasonic waves in solids and liquids, SONAR - Medical applications.

NON-DESTRUCTIVE TESTING: Introduction, Types, Visual inspection, Liquid penetrate testing, Ultrasonic Testing Systems, X - Ray radiography.

UNIT - 2**L-9**

LASERS: Characteristics of laser light, Spontaneous and Stimulated emission of radiation, He-Ne laser, CO₂ laser, Semiconductor laser, Applications.

HOLOGRAPHY: Holography and applications.

FIBER OPTICS: Principle of optical fiber, Acceptance angle, Numerical aperture, Types of fibers, Dispersion and attenuation in optical fibers, Optical fiber communication system, Fiber optic sensors.

UNIT - 3**L-9**

QUANTUM MECHANICS: Introduction, Matter waves, Schrodinger's time independent wave equation, Physical significance of the wave function, Particle in one dimensional potential well, Tunneling phenomenon.

FREE ELECTRON THEORY OF METALS: Introduction, Classical free electron theory, Electrical conductivity of metal, Quantum free electron theory, Fermi - Dirac distribution function and its variation with temperature.

PARTICLE ACCELERATORS: Introduction, Cyclotron, Synchrocyclotron, Betatron and applications.

UNIT - 4**L-9**

SOLAR ENERGY: Solar radiation, Photovoltaic effect, Solar cells, Efficiency of solar cell, Solar thermal energy conversion systems.

PHOTONICS: LED, LCD, Photo conducting materials, Photo detectors, Photonic crystals, Non-linear optical behaviour of materials, Applications.

UNIT - 5**L-9**

NANO MATERIALS: Introduction, Fabrication of nano materials - Ball milling - Sol-Gel method; Physical and chemical properties of nano materials, Applications.

FUNCTIONAL MATERIALS: Smart materials, Shape memory alloys, Chromic materials (Thermo, Photo and electro), Metallic glasses, Advanced ceramics, Composites, Fiber reinforced plastics/metals, Biomaterials.

TEXT BOOKS:

1. V. Rajendran, "Engineering Physics", 7th edition, McGraw Hill Education (India) Pvt.Ltd., 2014.
2. D.K. Bhattacharya and Poonam Tandon, "Engineering Physics", Oxford University Press, 2015.

REFERENCE BOOKS :

1. M.R. Srinivasan, "Engineering Physics", 1st edition, New Age International Publishers, 2008.
2. M.N. Avadhanulu & P.G. Kshirsagar, "Engineering Physics", 1st edition, Chand and Company Ltd., 1992.
3. Sukhatme S.P., "Solar Energy", 2nd edition, TMH publication, 2005.
4. Dr. Arumugam "Materials Science", 3rd edition, Anuradha Publications, 2002.

ACTIVITIES:

- *Estimation of acoustic impedance of a given material.*
- *Measurement of distances using ultrasonic range finder.*
- *Study of linear density of yarn/ fibre using Melde's experiment.*
- *Determination of refractive index of a given liquid using laser.*
- *Find the height of a room using laser.*
- *Identify the type of semi-conductor using Hall effect.*
- *Study of numerical aperture of optical fibres made of different materials.*
- *Design of solar panel to obtain required voltage.*
- *Evaluation of thermal conductivity of materials.*
- *Measure the temperature using thermo couple.*