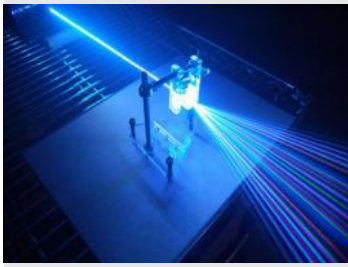
19HS115 ENGINEERING PHYSICS (C)



Source: physicsopenlab.org/

Hours Per Week :

L	T	P	C
3	0	2	4

Total Hours :

L	T	P
45	0	30

WA/RA	SSH/HSH	CS	SA	S	BS
20	15	0	10	2	3

COURSE DESCRIPTION AND OBJECTIVES:

The purpose of this course is to present the principles and concepts of Physical Optics. It provides an in-depth understanding of Lasers, optical fibres and ultrasonics followed by crystal Physics and Nano-materials and their applications as relevant to an Engineer.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Apply the concepts of Physical Optics in view of engineering applications.	1
2	Analyze the wavelengths of Laser for suitable applications in the field of industry, medicine and communication and to foster the knowledge on optical fibers to realize fiber optic communication and fiber optic sensors.	1
3	Recognize the importance of Crystal Physics relevant to biophysical systems.	2
4	Evaluate Ultrasonic wave velocity in liquids and solids and to apply Ultrasonic waves in medical diagnostics.	5
5	Compute the dimensions of nano particles to consolidate the physical aspects of nanomaterials	6

SKILLS:

- ✓ Apply the dynamics of light to realize various potential applications in Engineering.
- ✓ Evaluate the concepts of Lasers and optical fibers to realize vivid applications in Science and Engineering.
- ✓ Determine and analyse the crystal structures.
- ✓ Enunciate the importance of Ultrasonics in medicine.
- ✓ Production and characterization of nanomaterials aiming at their applications.

UNIT - I **L-8**

PHYSICAL OPTICS :

Interference: Introduction, Superposition principle; Division of wave front, Division of amplitude; Newton's rings, Michelson interferometer, Applications.

Diffraction: Introduction-Fraunhofer and Fresnel diffraction; Fraunhofer diffraction at a slit; Plane transmission diffraction grating, Dispersive and resolving powers of grating.

Polarization: Polarized and unpolarized light; Double refraction, Nicol prism, Quarter and half wave plates; Laurent's half shade polarimeter.

UNIT - II **L-12**

LASERS & OPTICAL FIBERS:

LASERS: Characteristics of Laser light, Spontaneous and stimulated emission of radiation; Types- He-Ne Laser, CO_2 Laser, Semiconductor Laser; Laser applications; Holography and applications.

FIBER OPTICS: Principle of optical fibre, Acceptance angle, numerical aperture; Types of fibres, dispersion and attenuation in optical fibres, Optical fibre communication system; Fiber optic sensors, Applications.

UNIT - III **L-8**

CRYSTAL PHYSICS:

Crystal Physics: Introduction-Fundamental terms of crystal physics, Lattice parameters; Crystal systems, Packing factor for SC, BCC and FCC; Miller indices, Distance of separation between successive (h k l) planes; X-ray diffraction, Bragg's law, Applications.

UNIT-IV **L-9**

ULTRASONICS:

Introduction, Properties of ultrasonic waves, Types of ultrasonic waves; Production of ultrasonic waves; Determination of velocity of ultrasonic waves in solids and liquids; Ultrasound in medicine.

UNIT- V **L-8**

ELEMENTS OF NANOMATERALS:

Introduction, Concept of quantum size effect; Synthesis of nanomaterials -top-down and bottom-up approaches- Ball milling & Sol-gel methods; Applications of nanomaterials; Characterization of nanomaterials by Electron microscopy and Atomic force microscopy (AFM).

TEXT BOOKS:

1. M.N.Avadhanulu, P.G.Kshirsagar and T.V.S.Arun Murthy, "A Text Book of Engineering Physics", 11th edition, S. Chand & Company Ltd., 2019.
2. Shatendra Sharma and Jyotsna Sharma, "Engineering Physics", Pearson India Education Services Pvt. Ltd., 2018.

REFERENCE BOOKS:

1. William T. Silfvast, "Laser Fundamentals", 2nd edition, Cambridge University Press, 2004.
2. D. Halliday, R. Resnick and J. Walker "Fundamentals of Physics", 6th edition, John Wiley and Sons, 2001.
3. N.Subrahmanyam and Brij Lal, "Optics", S. Chand & Company Ltd., 2018.
4. M.R.Srinivasan, "Engineering Physics" New Age International Publishers, 2006.
5. T. Pradeep, "A Text Book of Nanoscience and Nanotechnology", Tata Mc Graw Hill, 2003.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS **TOTAL HOURS:30**

1. Newton's rings–Determination of wavelength of a given light source.
2. Plane diffraction grating – Determination of dispersive power.
3. Polari meter –Determination of optical rotation by a given liquid.
4. Laser - Determination of wavelength by using diffraction grating.
5. Optical fibre – Determination of Numerical aperture – Acceptance angle.
6. Melde's Experiment - Determination of the frequency of tuning fork.
7. Photoelectric effect - Determination of Planck's constant.
8. Determination of velocity of ultrasonic wave's velocity in liquid medium using interferometer method.
9. Dye penetrant test method.
10. Determination of wavelength of given light source using diffraction grating method.
11. Stewart & Gees Experiment- Study of magnetic field along the axis of a current carrying coil.
12. Solar cell – Determination of fill factor & efficiency.
13. LED – Study of V-I characteristics.

LABORATORY MANUALS:

1. Dr.Ruby Das, C.S.Robinson, Rajesh Kumar and Prasanth Kumar Sahu, "A Text Book of Engineering Physics Practical", 1st edition, University Science Press, 2010.
2. Jayaraman, "Engineering Physics Laboratory Manual", 1st edition, Pearson Education, 2014.

ACTIVITIES:

- *Determination of thickness of a given thin object.*
- *Measurement of resolving power of grating.*
- *Measurement of specific rotation of a given medium.*
- *Designing laser instrument for measuring height of a room.*
- *Study on the Numerical Aperture of optical fibers prepared from different materials.*
- *Identification of materials from the determination of acceptance angle of a given fiber.*