

Course Code	Course Name	Hours per Week			Total
		L	T	P	Credits
EN3BS05	Engineering Physics	3	1	2	5

### Unit-I

Laser and Fiber Optics : Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient, Optical resonator and Condition necessary for active Laser action, Ruby Laser, He-Ne Laser- applications of laser diode. Optical Fibers - Core and cladding, total internal reflection step index and graded index fiber, Calculation of Numerical aperture and acceptance angle, losses in the fiber, applications, V-number.

### Unit-II

Optics : Interference of electromagnetic waves: Conditions for sustained interference, double slit as an example. Spatial and Temporal Coherence, Conservation of energy and intensity distribution, Fresnel's biprism, Newton's ring (No deduction necessary).

Diffraction of light: Fresnel and Fraunhofer class, Fraunhofer diffraction for single slit and double slits: Intensity distribution, N-slits and plane transmission grating. Missing orders and Rayleigh criterion, Resolving power of grating and telescope.

General concept of Polarization, Plane of vibration and plane of polarization, Malus's law, Qualitative discussion on Plane, Circularly and Elliptically polarized light, Polarization through reflection and Brewster's law, Double refraction (birefringence) - Ordinary and Extra-ordinary rays, Polaroid, Nicol prism.

### Unit-III

Quantum Mechanics and Crystal Physics: Quantum mechanics, Inadequacies of Classical Mechanics, Duality nature of electromagnetic radiation, De Broglie hypothesis for matter waves, Phase and group velocity. Heisenberg's uncertainty principle, Compton scattering, wave function, Schrodinger's wave equation, Particle confinement in 1D box (Infinite Square well potential).

Crystal Physics: Crystal directions, Planes and Miller indices, Symmetry elements, quasi crystals, Diamond and HCP crystal structure, packing factor, Reciprocal lattice.

### Unit-IV

Oscillations and Waves : Oscillatory motion and damping, Applications - Electromagnetic damping – eddy current.

Acoustics: Reverberation time, absorption coefficient, Sabine's and Eyring's formulae (Qualitative idea), Applications - Designing of hall for speech, concert, and opera;

Electromagnetic Waves: Scalar and vector fields, Gradient, divergence, and curl, Stokes' and Green's theorems, Concept of Displacement current, Maxwell's equations, Electromagnetic wave equations in free space and conducting media.

### Unit-V

Mechanics : Newton's laws of motion and its explanation with problems, various types of forces in nature (explanation), pseudo forces (e.g. Centrifugal force), Coriolis force and its applications, Motion under a central force, Gravitational law and field, Potential due to a spherical body. Gauss and Poission's equation of Gravitational self-energy, System of particles,

centre of mass and reduced mass, Conservation of linear and angular momentum, elastic and inelastic collisions and related problem.

### **Text Books**

1. Concepts of Modern Physics-Beiser, TMH.
2. Fundamentals of Physics-Halliday, Wiley India.
3. Gaur and Gupta, Engineering Physics, Dhanpat Rai Publications.
4. Satyaprakash, Engineering Physics, Pragati Prakashan.
5. A.M. Marikani, Engineering Physics, PHI Learning Pvt. India.
6. Griffiths, Introduction to Electrodynamics, Person.
7. Ghatak and Thyagrajan, An Introduction to Fiber Optics, Cambridge University Press.

### **References Books**

1. L.I. Schiff, Quantum Mechanics, Tata McGraw Hill.
2. C. Kittel, Introduction to Solid State Physics, Wiley India Pvt. Ltd.
3. E. Hecht, Optics, Addison-Wesley.
4. A. Ghatak, Optics, Tata McGraw-Hill Education.

### **List of Practical's**

1. To determine the wavelength of diode laser using a transmission grating.
2. To determine the wavelength of Sodium light source using Newton's ring experiment
3. To study spectrometer and determination of angle of prism.
4. To determine the specific optical rotation of sugar solution by biquartz Polarimeter.
5. To study working of Laser using "PhET" Laser Module by Simulation.
6. To determine the Standard deviation of following by algebraic formula and histogram
  - (i) Thickness of the given Scale by Vernier Callipers
  - (ii) Diameter of the wire by Screw Gauge.
7. To measure the numerical aperture of an optical fiber by scanning method.
8. To find the frequency of AC Mains using Melde's method in longitudinal arrangement.
9. To determine the radius of gyration with respect to the centre of gravity and to determine the value of acceleration due to gravity  $g'$  using compound (bar Pendulum).
10. Mini Project