

ENGINEERING PHYSICS

I Semester: AE / ME / CE / EEE / ECE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AHSC03	Foundation	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
Prerequisite: Basic principles of waves								
I. COURSE OVERVIEW:								
<p>This course develops abstract and critical reasoning by studying mathematical and logical proofs and assumptions as applied in basic physics and to make connections between physics and other branches of sciences and technology. The topics covered include waves, non-dispersive transverse and longitudinal waves, light and optics, wave optics, lasers, introduction to quantum mechanics, solution of wave equation and introduction to solids and semiconductors. The course helps students to gain knowledge of basic principles and appreciate the diverse applications in technological fields in respective branches.</p>								
II. COURSE OBJECTIVES:								
The students will try to learn:								
<p>I. The basic formulations in wave mechanics for the evolution of energy levels and quantization of energies for a particle in a potential box with the help of mathematical description</p> <p>II. The fundamental properties of semiconductors including the band gap, charge carrier concentration, doping and charge carrier transport mechanisms</p> <p>III. The simple optical setups and experimental approaches of Light and Laser using its interaction with matter</p> <p>IV. The basic studies between different harmonic oscillators and different waves for using those relationships on practical problems.</p>								
III. COURSE OUTCOMES:								
After successful completion of the course, students should be able to:								
CO 1	Apply	the concepts of dual nature of matter and Schrodinger wave equation to a particle enclosed in simple systems.					Understand	
CO 2	Demonstrate	the classification of solids and important aspects of semiconductors in terms of carrier concentration and Fermi level.					Apply	
CO 3	Compare	the concepts of LASER and normal light in terms of mechanism and working principles for applications in various fields and scientific practices.					Understand	
CO 4	Explain	functionality of components in optical fiber communication system by using the basics of signal propagation, attenuation and dispersion.					Understand	
CO 5	Interpret	the phenomenon of interference and diffraction by using the principles of wave motion and superposition.					Understand	
CO 6	Make use of	the concept of simple harmonic motion and arrive at expressions for damped, forced harmonic oscillators and wave equations by using necessary mathematical formulations.					Apply	
IV. SYLLABUS:								
MODULE-I: QUANTUM MECHANICS (09)								
Introduction to quantum physics, de-broglie's hypothesis, Wave-particle duality, Davisson and Germer experiment, Time-independent Schrodinger equation for wave function, Physical significance of the wave function, Schrodinger equation for one dimensional problems–particle in a box.								
MODULE –II: INTRODUCTION TO SOLIDS AND SEMICONDUCTORS (09)								
Introduction to classical free electron theory and quantum theory, Bloch's theorem for particles in a periodic potential (Qualitative treatment), Kronig-Penney model (Qualitative treatment), classification: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Carrier concentration, Dependence of Fermi level on carrier-concentration and temperature, Hall effect.								

MODULE –III: LASERS AND FIBER OPTICS (09)

Characteristics of lasers, Spontaneous and stimulated emission of radiation, Metastable state, Population inversion, Lasing action, Ruby laser, He-Ne laser and applications of lasers.

Principle and construction of an optical fiber, Acceptance angle, Numerical aperture, Types of optical fibers (Single mode, multimode, step index, graded index), Optical fiber communication system with block diagram and Applications of optical fibers.

MODULE –IV: LIGHT AND OPTICS (09)

Principle of superposition of waves, Young's double slit experiment, Fringe width, Newton's rings.

Fraunhofer diffraction from a single slit, double slit (extension to N slits) and diffraction grating experiment.

MODULE –V: HARMONIC OSCILLATIONS AND WAVES IN ONE DIMENSION (09)

Simple harmonic oscillator, Damped harmonic oscillator, Forced harmonic oscillator. Transverse waves and Longitudinal wave equation, Reflection and transmission of waves at a boundary, Harmonic waves.

V. TEXT BOOKS:

1. G. Main, "Vibrations and Waves in Physics", Cambridge University Press, 1993.
2. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001.
3. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", Chand & Co. New Delhi, 1st Edition, 2010.

VI. REFERENCE BOOKS:

1. H.J. Pain, "The Physics of Vibrations and Waves", Wiley, 2006.
2. Ghatak, "Optics", McGraw Hill Education, 2012.
3. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.

VII. WEB REFERENCES:

1. <http://link.springer.com/book>
2. <http://www.thphys.physics.ox.ac.uk>
3. <http://www.sciencedirect.com/science>
4. <http://www.e-booksdirectory.com>

VIII. E-TEXT BOOKS:

1. <http://www.peaceone.net/basic/Feynman/>
2. <http://physicsdatabase.com/free-physics-books/>
3. <http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf>
4. www.freebookcentre.net/Physics/Solid-State-Physics-Books.html