

SIDDARTHA INSTITUTE OF SCIENCE AND TECHNOLOGY: PUTTUR

I B. TECH, I – Semester

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Branch: ELECTRICAL ENGINEERING.

PHYSICS (18HS0849)

Objectives:

- Will recognize the various basic terms related to Oscillations.
- The basic concepts related properties of Lasers.
- Will understand the dual nature of Matter.
- Recognize importance of free electrons theory and semiconductors.
- To understand the fundamentals Nano materials.

Unit – I: WAVES & OSCILLATIONS

Mechanical and electrical simple harmonic oscillators - damped harmonic oscillator - forced mechanical and electrical oscillators - impedance, steady state motion of forced damped harmonic oscillator.

Unit – II: LASERS.

Properties of laser beams: mono-chromaticity, coherence, directionality and brightness Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne), solid-state lasers (Neodymium) , applications of lasers in science, engineering and medicine.

UNIT – III: INTRODUCTION TO QUANTUM MECHANICS & SOLUTION OF WAVE EQUATION.

Wave nature of Particles – de Broglie hypothesis, Heisenberg's Uncertainty principle. Time-dependent and time - independent Schrodinger equation for wave function – physical significance of wave function - Solution of stationary-state Schrodinger equation for one dimensional problems–particle in a box.

Unit – IV: INTRODUCTION TO SOLIDS & SEMICONDUCTORS.

Free electron theory of metals - and origin of energy bands. Types of electronic materials: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Fermi level – effect of temperature - diffusion and drift –Einstein Relation- Hall effect and it's application.

UNIT-V: PHYSICS OF NANOMATERIALS.

Introduction, significance of nano scale – surface area and quantum confinement- Quantum dot, Quantum well ,Quantum wire -Synthesis of nanomaterials- Top Down Process-

Ball Milling ; Bottom Up Process: Sol-Gel method– CNT-Properties of Graphene-Applications.

Reference books:

1. H. J. Pain, “The physics of vibrations and waves”, Wiley, 2006.
2. E. Hecht, “Optics”, Pearson Education, 2008.
3. O. Svelto, “Principles of Lasers”, Springer Science & Business Media, 2010.
4. D. J. Griffiths, “Quantum mechanics”, Pearson Education, 2014.
5. D. A. Neamen, “Semiconductor Physics and Devices”, Times Mirror High Education Group, Chicago, 1997.
6. B.E.A. Saleh and M.C, Tech, Fundamentals of photonics, John Wiley & Sons.
7. Engineering Physics – K.Thyagarajan, MCGrawHill Education Private Ltd, New Delhi.

Course outcomes:

Studies will be familiar with

- Various basic terms related to waves and Oscillations.
- Some of the basic concepts related properties of Lasers.
- Able to explain Dual nature of matter.
- Recognize importance of free electrons theory and semiconductors.
- Understand the importance of Nanotechnology.