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| **16BS1T03: Engineering Physics** | | | | |

**COURSE OBJECTIVES**

1. **Understand** the basic *concepts, definitions, characteristics and phenomena.*
2. **Recognize** the *classical ideas* and *physical phenomena* and also *define* and *analyze* the concepts.
3. **Assess the role of Science** and in particular, *physics*, in helping us better understanding the *complex, technological* society of which we are apart.
4. **Investigate** and understand physical behavior in the lab using *scientific reasoning* and *logic* and interpret the result of simple *experiments* and *demonstration* of physical principles and also *evaluate* the impact of physical discoveries on how we view the world.
5. **Solve** a variety of basic *problems and given word problems*, student will identify the physical principle required to solve the problem, *formulate the equation* necessary to solve the problem.
6. **Effectively communicate** *experimental results and solutions* to application problems through oral and written reports.

**Explain** physical phenomena using *realistic mathematical modeling* at the level of general physics

**COURSE OUTCOMES**

**Student able to understand:**

* 1. Basic crystal systems and determination of crystal structures.
  2. Proper choice of Magnetic/Dielectric Materials as per the functionality of appliance could be realized.
  3. Concept of Magnetic Induction and Maxwell’s equations.
  4. Application of Schrodinger equation and Concept of band theory of solids.
  5. Pure & doped Semiconductor devices for better utility.
  6. Optical properties of solids and super conducting properties of solids and their applications.

**Syllabus**

**UNIT-I CRYSTALLOGRAPHY AND X-RAY DIFFRACTION**

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC-Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg’s law- Bragg’s Spectrometer.

**UNIT-II MAGNETIC AND DIELECTRIC PROPERTIES**

**MAGNETIC PROPERTIES:** Origin of magnetic moment-Magnetic Materials: Classification of Magnetic Materials and properties - Hysteresis Loop of ferromagnetic material.

**DIELECTRIC PROPERTIES:** Introduction - Electronic, ionic and orientational (Qualitative) polarizations - Internal fields in solids – Clausius - Mossotti equation.

**UNIT-III ELECTROMAGNETISM**

Introduction-Concept of Electric Flux - Gauss’s Law – Integral and Differential forms - Magnetic Field –The Biot-Savart’s Law - Ampere’s Law - B for a Solenoid - Faraday’s Law of induction - Lenz’s law - Displacement Current - Maxwell’s Equations.

**UNIT –IV QUANTUM MECHANICS AND BAND THEORY OF SOLIDS:**

De Broglie concept of matter waves, Schrodinger Time Independent wave equation – Application to a Particle in a box- Defects of Classical free electron theory of metals – Quantum free electron theory – concept of Fermi energy - Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of materials into conductors, semiconductors & insulators.

**UNIT – V SEMICONDUCTOR PHYSICS**

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion currents – Einstein’s equations - Hall Effect and its applications.

**UNIT-VI LASERS AND SUPER CONDUCTIVITY**

**LASERS:** Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein’s coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

**SUPERCONDUCTIVITY:** General properties – BCS Theory of Superconductivity - Meissner effect – Type-I and Type-II superconductors – Flux quantization –Josephson effects – Applications of Superconductors.

**Text Books**

1. A text book of Engineering Physics by M-N- Avadhanulu & P.G. Kshirasagar (S-Chand publications)
2. Engineering Physics by R.K. Gaur and S.L. Gupta.

**Reference Books**

1. Engineering Physics‟ by Palanisamy (Scitech Publishers)
2. Engineering Physics by Mani Naidu S (Pearson Publications)
3. Introduction to solid state physics‟ by Charles Kittle (Willey India Pvt-Ltd)
4. Applied Physics‟ by T. Bhimasenkaram (BSP BH Publications)
5. Applied Physics‟ by M. Arumugam (Anuradha Agencies)

# Physics by David Halliday and Robert Resnick – Part I and Part II