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| **19BS1T01: ENGINEERING PHYSICS** |

**COURSE OUTCOMES**

**After completion of course student able to:**

1. Describe Basic crystal systems and determination of crystal structures
2. Explain Magnetic and Dielectric Materials properties
3. Describe Concept of Magnetic Induction and Super Conducting properties
4. Explain Pure & Doped Semiconductor materials for better utility
5. Describe Optical fibers and Optical properties of materials and their applications

**SYLLABUS**

**UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION**

**CRYSTAL STRUCTURE:**

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

**X-RAY DIFFRACTION:**

Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg’s law-Bragg’s Spectrometer.

**Learning Outcomes: At the end of this unit, the students will be able to**

* **Explain** the seven crystal systems
* **Interpret** the crystal structure based on Bragg’s law

**UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES**

**MAGNETIC PROPERTIES:** Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis- soft and Hard Magnetic materials.

**DIELECTRIC PROPERTIES:** Introduction-Dielectric constant- Relation between three electric vectors-Electronic and ionic polarizations (Quantitative) - orientation polarizations (Qualitative) - Internal fields in solids- Clausius - Mossotti equation.

**Learning Outcomes: At the end of this unit, the students will be able to**

* **Classify** the magnetic materials into dia, para, ferro, anti ferro and ferri
* **Explain** the importance of hysteresis
* **Explain** the concept of polarization in dielectric materials.
* **Summarize** various types of polarization of dielectrics .
* **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

**UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY**

**ELECTROMAGNETIC WAVES:** Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere’s law - Biot-Savart’s law-Magnetic Induction due to current carrying circular loop- Faraday’s law - Maxwell’s equations.

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

**Learning Outcomes: At the end of this unit, the students will be able to**

* **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
* **Explain** Maxwell’s equations
* **Summarize** various properties and applications of superconductors

**UNIT-IV: PHYSICS OF SEMICONDUCTORS:**

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein’s equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

**Learning Outcomes: At the end of this unit, the students will be able to**

* **Summarize** various types of solids based on band theory.
* **Outline** the properties of n-type and p-type semiconductors.
* **Identify** the type of semiconductor using Hall effect

 **UNIT-V: LASERS AND OPTICAL FIBERS**

**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.

**FIBER OPTICS:** Introduction to Optical fibers- Critical angle of propagation- Total internal reflection-Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Applications of optical fibers.

**Learning Outcomes: At the end of this unit, the students will be able to**

* **Design** various types of lasers
* **Explain** the principle and propagation of light through Optical fibers
* **Discuss** the application of lasers and Optical fibers

**TEXT BOOK:**

A text book of “Engineering Physics” by M. N. Avadhanulu, P.G. Kshirasagar & TVS Arun Murthy, S Chand publications, 11th Addition 2019.

**REFERENCE BOOKS:**

1. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Education, 2018.
2. Engineering Physics by Palanisamy (Scitech Publishers)
3. Engineering Physics by D. Thirupathi Naidu and M. Veeranjaneyulu