CH122	PHYSICS OF ENGINEERING MATERIALS	L	T	P	C	Int	Ext
		3	-	-	3.0	30	70

Semester II [First Year]

COURSE OBJECTIVES:

1. To import knowledge on crystal structures and their characterization.
2. Explain various magnetic and dielectric materials and their applications.
3. To introduce the notions of light matter interaction, fabrication of lasers, optical fibers and its applications.
4. Enlightening the concepts of nano materials and characterization.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. Recognize and analyze the Significance of crystal structures.
2. Explain various the importance of magnetic & dielectric materials.
3. Identify and illustrate types of lasers, optical fibers and their applications.
4. Acquire knowledge on nano materials, fabrication methods and their characterization.

UNIT I [CO:1] **(15)**

Crystallography and Crystal structure analysis:

Classification of solids, Fundamental definitions in crystallography(lattice, basis, unit cell, unit cell parameters), Bravais lattices (types of crystal systems), Miller indices, d spacing, Atomic packing factor for SC, BCC, FCC structures.

Crystal structure analysis: Diffraction of X-rays from a crystal-BraggÃ¢â‚¬â„¢s law, Laue method, BraggÃ¢â‚¬â„¢s X-ray spectrometer.

UNIT II [CO:2] **(15)**

Magnetic & dielectric materials

Magnetic Materials: Origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve, soft and hard magnetic materials, Ferrites and its uses.

Dielectric Materials: Fundamental definitions: Electric dipole moment, polarization vector, polarizability, electric displacement, dielectric constant and electric susceptibility, Types of polarizations - Electric and ionic polarizations, applications of dielectrics.

UNIT III [CO:3] **(15)**

Lasers and Optical Fibers

Lasers: Interaction of radiation with matter, spontaneous and stimulated emissions, characteristics of lasers, basic requirements for the construction of lasers (Pumping, population inversion and optical resonant cavity), construction and working of Ruby laser, He-Ne laser, applications of lasers.

Optical Fibers: principle, basic structure, Numerical aperture & acceptance angle, classification (propagation of light in various fibers based on refractive index), Light wave communication through optical fibers, applications of optical fibers.

UNIT IV [CO:4] **(15)**

Nano Technology and characterization of materials

Basic Concepts of nano science, nanotechnology, nano scale, materials used in nanotechnology,

surface to volume ratio, properties of nano materials, methods of preparation: Top down & Bottom up approach, sol-gel and chemical vapour deposition (CVD) methods, applications of nano materials.

XRD (Debye-Scherrer method), Scanning Electron Microscope (SEM).

LEARNING RESOURCES:

TEXT BOOK(s):

1. A Text book of Engineering Physics, M. N. Avadhanulu, & TVS Arun Murthy, S. Chand Publications, 1st Edition 2024.(Units I,II, III & IV)
2. Material Science V. Rajendran Ã¢â‚¬â€œ MGH. (Units I,II, III & IV)
3. Materials science Ã¢â‚¬â€œ M. Vijaya and G. Rangarajan, TMH, New Delhi.

REFERENCE BOOK(s):

1. Engineering Physics, D.K.Bhattacharya & Poonam Tandon, Oxford University Press, 2015.
2. B. K. Pandey, S. Chaturvedi .,Ã¢â‚¬Å“Engineering PhysicsÃ¢â‚¬Â• - Cengage Publications, 2012.
3. Materials science Ã¢â‚¬â€œ M. Vijaya and G. Rangarajan, TMH, New Delhi.

WEB RESOURCES:

1. http://nptel.iitm.ac.in/courses/
2. Course relevant website : www.rvrjcce.ac.in/moodle