**20SH1201 - ENGINEERING PHYSICS**

(Common to CE&ME)

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| **Course Category:** | Basic Science | **Credits:** | 3 |
| **Course Type:** | Theory | **Lecture-Tutorial-Practical:** | 2-1-0 |
| **Pre-requisite:** | Fundamental concepts of Physics | **Sessional Evaluation:**  **External Exam Evaluation:**  **Total Marks:** | 40  60  100 |

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| **Course Objectives** | 1. To acquire knowledge of interference, diffraction and polarization of light. 2. Analyze principles of lasers and optical fibers applied in Engineering Field 3. Apply principles of Quantum Mechanics to various atomic phenomena. 4. Explain & provide the knowledge about semiconductors and their use in electronic devices. 5. To gain knowledge about dielectrics & magnetic materials focusing on their applications. 6. To understand importance and role of ultrasonics and nanomaterials in Civil & Mechanical engineering | |
| **Course Outcomes** | CO1 | Understand the phenomena of wave optics and its principles |
| CO2 | Understand & analyses different kinds of lasers and principles of optical fibers. |
| CO3 | Able to understand the basic concepts of quantum physics applicable to solids. |
| CO4 | To know the concepts of electron theory of solids and properties of semiconductor materials by projecting the view of energy bands. |
| CO5 | Understand the concept of polarization& magnetization and also applications of dielectric& magnetic materials in various disciplines. |
| CO6 | Basic idea about ultrasonics production & properties and nanomaterials with their uses in various fields of Science & Technology. |
| **Course Content** | **UNIT-I**  **WAVE OPTICS**  Interference: Introduction – Superposition of waves – interference by division of wave front (Young’s double slit experiment) & by division of amplitude (Newton rings) – Diffraction: Introduction - Fraunh offer diffraction due to single slit, double slit– Diffraction grating – Polarization – Introduction – Representation of light – Double refraction and positive & negative crystals – Nicol prism – Half and quarter wave plates.  **UNIT-II**  **LASERS & OPTICAL FIBERS**  **Lasers:** Spontaneous & simulated emission - Population inversion - Types of Lasers: Solid state lasers (Nd-YAG), Gas lasers (He–Ne) – Properties of laser beam: monochromacity, coherence, directionality & brightness – Applications of lasers in science, engineering & medicine.  **Optical fibers:** Introduction – Construction and working principle of optical fiber – Acceptance angle –Numerical Aperture – Types of optical fibers – Block diagram of optical fiber communication system – Applications of optical fibers. | |
|  | **UNIT-III**  **PRINCIPLES OF QUANTUM MECHANICS**  Black body radiation – Laws of explaining the energy distribution- Planks quantum theory of black body radiation – Stefan-Boltzmann, Wein’s displacement & Rayleigh Jean’s law - Photon & its properties - Wave and particle duality – de-Broglie hypothesis – Properties of matter waves – de-Broglie wave length – Heisenberg uncertainty principle – Schrodinger time independent wave equation – Physical significance of wave function - Particle in a one dimensional potential box.  **UNIT-IV**  **ELECTRON THEORY AND SEMICONDUCTORS**  **Electron theory**: Free electron theory (classical & quantum: postulates, success& drawbacks) - Fermi–Dirac distribution function & its temperature dependence – Kronig–Penny model (nonmathematical treatment) – Concept of band – Classification of solids into conductors , semiconductors & insulators.  **Semiconductors**: Intrinsic & extrinsic semiconductors (qualitative) – Fermi level in extrinsic semiconductors – Conductivity in semiconductors: Drift & diffusion – Einstein relation – Hall effect & its applications.  **UNIT-V**  **DIELECTRIC AND MAGNETIC PROPERTIES**  **Dielectric Properties:** Basic definitions – Electronic, ionic (quantitative) & orientation (qualitative) polarizations – Internal field in solid dielectrics – Clausius- Mossotti relation – Ferroelectricity.  **Magnetic properties:** Introduction – Basic definitions – Origin of magnetic moment – Classification in to dia, para, ferro, anti-ferro & ferri magnetic materials – Hysteresis – Soft & hard magnetic materials - Applications of magnetic materials.  **UNIT VI**  **ULTRASONICS AND PHYSICS OF NANOMATERIALS**  **Ultrasonics:** Introduction and properties of ultrasonics – Production by Piezo electric method – Detection of ultrasonics – Applications of ultrasonics.  **Physics of Nanomaterials:** Introduction – Significance of nanoscale – Types of nanomaterials – Properties of nanomaterials: physical, mechanical, magnetic and optical – Synthesis of nanomaterials: Top-down-Ball millings, bottom up – Chemical vapour deposition – Applications of nanomaterials. | |
| **Text Books & Reference Books** | **TEXTBOOKS:**   1. R K Gaur and S L Gupta, *“Engineering Physics”*, Dhanpat Rai Publishing Co. Pvt. Ltd., 8th Edition, 2012. 2. P K Palanisamy, *“Engineering Physics*” SciTech **Publications (India) Pvt. Ltd,** Vol-I, **2015.** 3. S Mani Naidu, *“Engineering Physics”*, Pearson Education India, 2009.   **REFERENCE BOOKS:**  K Thyagarajan, *“Engineering Physics*”, McGraw Hill Education.   1. S L Gupta and Sanjeev Gupta, “*Unified Physics”*, (Mechanics and Waves & Oscillations), Vol-I, Jai Prakash Nath Publications, 2018. | |