**N.B.K.R. INSTITUTE OF SCIENCE & TECHNOLOGY:: VIDYANAGAR**

**(AUTONOMOUS)**

**I B.Tech., II – Semester :ENGINEERING PHYSICS**

**(Common to CIVIL&MECHANICAL Branches)**

**(New regulation w.e.f. 2019 – 2020)**

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

|  |  |  |
| --- | --- | --- |
| **CourseObjectives** | Students undergoing this course are expected to   1. To acquire knowledge of interference, diffraction and principles of laser applied in Engineering Field. 2. Apply principles of Quantum Mechanics to various atomic phenomena. 3. Explain and provide the knowledge about semiconductors and their use in electronic devices. 4. To gain knowledge about dielectrics & magnetic materials focussing on their applications. 5. Analyze various harmonic motions and understand concept of resonance. 6. To understand importance and role of optical fibers and nanomaterials in Civil & Mechanical engineering | |
| **CourseOutcomes** | Upon successful completion of the course, the student will be able to: | |
| **CO1** | Understand the phenomena of wave optics, principles of lasers and its applications. |
| **CO2** | Able to understand the basic concepts of quantum physics applicable to solids. |
| **CO3** | To know the concepts of electron theory of solids and properties of semiconductor materials by projecting the view of energy bands. |
| **CO4** | Understand the concept of polarization& magnetization and also applications of dielectric& magnetic materials in various disciplines. |
| **CO5** | Understand &analyse different kinds of oscillatory motions. |
| **CO6** | Basic ideas about optical fibers and nano materials with their uses in various fields of Science & Technology. |
|  | **UNIT-I**  **Wave optics and Lasers**  **Wave Optics** : Introduction (Interference of light) – Superposition of waves – interference by division of wave front (Young’s double slit experiment) & by division of amplitude (Newton rings) – Fraunhoffer diffraction due to single slit, double slit– Diffraction grating and its resolving power,  **Lasers :**Spontaneous& simulated emission - Population inversion - Types of Lasers: Solid state lasers (Ruby), Gas lasers (He–Ne) – Properties of laser beam: monochromacity, coherence, directionality & brightness – Applications of lasers in science, engineering & medicine. | |

|  |  |
| --- | --- |
| **Course Content** | **UNIT-II**  **Principles of Quantum mechanics**: Black body radiation – Laws of explaining the energy distribution- Planks quantum theory of black body radiation – Stefan-Boltzman, 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-III**  **Electron theory and Semiconductors**  **Electron theory**: Free electron theory (classical &quantum : postulates, success& drawbacks) - Fermi–Dirac distribution function & its temperaturedependence – Kronig–Penny model (non mathematical 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-IV**  **Dielectric and Magnetic properties**  **Dielectric Properties:** Basic definitions – Electronic, ionic (quantitative )& orientation (qualitative) polarizations – Internal field in solid dielectrics – Clausius- Mossotti relation.  **Magnetic Materials:** 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-V**  **Waves & Oscillations:** Review of simple harmonic motion - Free vibrations – Torsional pendulum – Damped harmonic motion: over damped, critically damped and lightly damped oscillations.  Forced oscillations & resonance - Sharpness of resonance and Q-factor – Electrical analogy for an oscillator.  **UNIT VI**  **Optical fibers and Physics of Nanomaterials**  **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.  **Physics of Nanomaterials:** Introduction – Significance of nanoscale – Types of nanomaterials – Properties of nanomaterials: physical, mechanical, magnetic and optical – Synthesis of nanomaterials: top-down-Ball milling, bottom up – Chemical vapour deposition – Applications of nanomaterials. |

|  |  |
| --- | --- |
| **Text Books & Reference Books** | **TEXT BOOKS:**  1.Engineering Physics by Gaur and Gupta, Dhanpatrai Publications  2.Engineering Physics by Palanisamy, Scitech.  3.Engineering Physics by K.Thyagarajan, McGraw Hill.  **REFERENCE BOOKS:**  1. Engineering Physics by Maninaidu, Pearson.  2.Unified Physics Vol. 1 (Mechanics and Waves & Oscillations), Jai Prakashnath& co., Meerut. |