| Regulation GRBT-20 | Godavari Institute of Engineering & Technology (Autonomous) | I B.Tech | | | |
|---|---|---|---|---|---|
| Course Code | APPLIED PHYSICS (For All Circuital Branches like ECE, EEE, CSE, CSE (AI & ML), CSE (Cyber Security) etc) | | | | |
| Teaching | Total Contact Hours – 48h | L | T | P | C |
| | | 3 | 0 | 0 | 3 |

**Course Objective**

Physics Curriculum is re-oriented to the needs of all the branches of graduate engineering courses that serve as a transit to understand specific advanced topics.

**Course Outcomes:**

| On Completion of the course, the students will be able | |
|---|---|
| CO1: | To impart knowledge of physical optical phenomenon like Interference, Diffraction and polarization involving design of optical instruments with higher resolution |
| CO2: | To demonstrate the concept on the absorption and spontaneous and stimulated emission in two level system and the conditions for laser amplification and explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation with their applications. To explain the concept of dielectric constant and polarization in dielectric materials and summarize Gauss's law in the presence of dielectrics. and classify the magnetic materials based on susceptibility and their temperature dependence. |
| CO3: | To study the Schrödinger equation for standard systems with both analytical and numerical methods, and then interpret the results. And to explain the physical states of elementary particles and atoms in different systems based on quantum mechanics |
| CO4: | To classify the energy bands of semiconductors and outline the properties of n-type and p-type semiconductors |

**Syllabus:**

**UNIT –I**

**WAVE OPTICS** **10h**

**INTERFERENCE**: Introduction - Principle of Superposition- Interference in thin films (reflected light) - Newton's Rings – Engineering Applications

**DIFFRACTION**: Introduction – Types of Diffractions – Fraunhofer Single slit Diffraction (Quantitative) – Double Slit - N slits/Grating (Qualitatively) – Grating Formula – Rayleigh's Criterion for resolving power of grating

**POLARIZATION**: Introduction - Types of Polarization (plane, circular, elliptical) – Experimental Production of polarized light by reflection, refraction and double refraction - Nicol's Prism - Half wave and Quarter wave plates

**UNIT –II** **8h**

**Laser**

Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Pumping schemes – Population inversion – Three level system and meta stable state - Lasing Schemes – Ruby Laser – He-Ne laser - Applications of lasers.

**Fiber Optics**

Introduction - Principle and structure of Optical Fibers - Acceptance angle - Numerical Aperture - Classification of optical fibers based on Refractive index profile and modes – Applications for the optical fibers

**UNIT –III** **10h**

**DIELECTRICS PROPERTIES**

Introduction - Electric polarization - Dielectric polarizability, Susceptibility and Dielectric constant- Types of dielectric polarizations – Electronic, Ionic, Orientational & Space (Qualitatively) – Internal Field (or) Local field in solids - Claussius-Mosotti equation – Ferroelectrics (Qualitatively)

**MAGNETIC PROPERTIES**

Introduction - Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials (Dia, Para, Ferro/Ferri/Antiferro) with regard to temperature and field - Weiss ferromagnetic domain theory (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites

**UNIT –IV** **10h**

**QUANTUM MECHANICS:**

Introduction to matter waves – Davison and Germer Experiment - Heisenberg's Uncertainty Principle – Pauli's exclusion principle – Wave Function - Schrodinger Time Independent and Time Dependent wave equations - Particle in a box

**FREE ELECTRON THEORY:**

Classical free electron theory –Meris and Demerits - Density of states – Fermi Energy - Fermi Distribution Function – Quantum free electron theory – Electrical Conductivity

**UNIT –V** **10h**

**Band Theory of Solids:**

Introduction - Bloch's theorem (Qualitatively) – Kronig Penny model – Origin of Energy Bands – Effective mass & band gap – Demarcation of band gap for metals, insulators, semiconductors – Concept of Hole

**Semiconductor Physics:**

Introduction – Density of carriers in Intrinsic and Extrinsic Semiconductors-Drift, Diffusion & Mobility - Einstein's equation – Hall effect

**Text books**


1. M. R. Srinivasan, "Engineering Physics", New Age International Publishers, 2011.
2. D. Thirupathi Naidu, M. Veeranjaneyulu, "Engineering Physics", Techno Series, 2019.
3. P. K. Palanisamy, "Applied Physics", Sci-tech Publications.
4. A.J.Decker, "Solid State Physics", Mac Millan.
5. M. N. Avadhanlu, P. G. Kshirasagar "A Text book of Engineering Physics", S. Chand Publications, 2017.


**Reference Books**


1. Principles of Physics by Resnick, Halliday, and Walker, Printice Hall Publications
2. Gerd Keiser "Optical Fiber Communications"- 4/e, Tata Mc GrawHill ,2008
3. S.M.Sze "Semiconductor devices-Physics and Technology"-Wiley,2008
4. H. K. Malik and A. K. Singh "Engineering Physics", McGraw Hill Publishing Company Ltd, 2018.


**Web Links:**

1. https://www.britannica.com/science/interference-physics
2. http://vlab.amrita.edu/index.php -Virtual Labs, Amrita University

**CO-PO Mapping:**

**1: Slight [Low]; 2: Moderate[Medium]; 3: Substantial[High], '-' : No Correlation**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 2 | 1 | 2 | 2 | - | - | 2 | 1 | 1 |
| CO2 | 2 | 2 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | - | 2 | 2 |
| CO3 | 2 | 3 | 2 | 1 | 2 | 2 | - | 2 | 2 | 1 | 2 | 1 |
| CO4 | 2 | 3 | 2 | 1 | - | 2 | 1 | 2 | 2 | 2 | 1 | - |


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