JAWAHARLAL NEHRUTECHNOLOGICALUNIVERSITY:KAKINADA

KAKINADA–533003, Andhra Pradesh, India

R-13 Syllabus for CSE JNTUK

I Year-II Semester		L	T	P	C
		0	3+1	0	3

ENGINEERING PHYSICS (R13203)

Prerequisite Course: Fundamentals of basic physics

Course Description and Objectives: Apply the principles of physics in operating the modern devices.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes.

Cos	Course Outcomes	POs
1	Apply the knowledge of physical optics in operating various instruments with high resolution for different applications.	2
2	Able to understand the production of Lasers and their use in communication through optical fiber	1
3	Gain the knowledge of magnetic, dielectric and superconducting behaviour of various materials to apply in industry and engineering.	1
4	Understanding the factors effecting the acoustics of buildings and propagation of EM waves in different media.	1
5	Apply the knowledge of quantum views for understanding the formation of energy bands in solids and their classification.	2
6	Understand the physics of charge transport mechanism in semiconductors for various applications.	1

Syllabus:

PHYSICAL OPTICS FOR INSTRUMENTS

UNIT I:

Objective: Designing an instrument and enhancing the resolution for its operation would be effective as achieved through study of applicational aspects of physical Optics.

INTERFACE: Introduction – Interference in thin films by reflection – Newton's rings.

DIFFRACTION: Introduction – Fraunhofer diffraction - Fraunhofer diffraction at double slit (qualitative) – Diffraction grating – Grating spectrum – Resolving power of a grating – Rayleigh's criterion for resolving power.

POLARIZATION: Introduction – Types of Polarization – Double refraction – Quarter wave plate ad Half Wave plate.

UNIT II:

COHERENT OPTICS – COMMUNICATIONS AND STRUCTURE OF MATERIALS

Objective: while lasers are trusted Non-linear coherent sources established for the fitness of instrumentation, establishing a structure property relationship for materials requires allotment of an equivalent footing in convening the physics knowledge base.

LASERS: Introduction – coherent sources – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion – Three and Four level pumping schemes – Ruby laser – Helium Neon laser.

FIBER OPTICS : Introduction – Principle of Optical Fiber – Acceptance angle and acceptance cone – Numerical aperture.

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

X-RAY DIFFRACTION TECHNIQUES : Directions and planes in crystals – Miller indices – Separation between successive [h k l] planes – Bragg's law.

UNIT III:

MAGNETIC, ELECTRIC FIELD RESPONSE OF MATERIALS & SUPERCONDUCTIVITY

Objective: Many of the Electrical or Electronic gadgets are designed basing on the response of naturally abundant and artificially made materials, while their response to E- or H- fields controls their performance.

MAGNETIC PROPERTIES: Magnetic permeability – Magnetization – Organ or magnetic moment – Classification of Magnetic materials – Dir, para, Ferro, anti ferro and ferri-magnetism – Hysteresis curve

DIELECTRIC PROPERTIES: Introduction – Dielectric constant – Electronic, ionic and orientational polarization – internal fields – Clausius – Mossotti equation – Dielectric loss, Breakdown and Strength.

SUPERCONDUCTIVITY: General properties – Meissner effect – Type I and Type II superconductors – BCS Theory Flux quantization London's equations – Penetration depth – DC and AC Josephson effects – SQUIDS.

UNIT – IV:

ACOUSTICS AND EM – FIELDS:

Objective: The utility and nuances of ever pervading SHM and its consequences would be the first hand-on to as it clearly conveyed through the detailed studies of Acoustics of Buildings, while vectorial concepts of EM fields paves the student to gear – up for a deeper understanding.

ACOUSTICS: Sound absorption, absorption coefficient and its measurements, Reverberations time – Sabine's formula, Eyring's formula.

ELECTRO-MAGNETIC FIELDS: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations (Calculus approach).

UNIT – V:

QUANTUM MECHANICS FOR ELECTRONIC TRANSPORT

Objective: The discrepancy between classical estimates and laboratory observations of physical properties exhibited by materials would be lifted out through the understanding quantum picture of sub-atomic world dominated by electron and its presence.

QUANTUM MECHANICS: Introduction to matter waves – Schrodinger Time Independent and Time Dependent wave equations – Particle in a box.

FREE ELECTRON THEORY: Classical free electron theory – electrical conductivity – Mean free path – Relaxation time and drifty velocity – Quantum free electron theory – Fermi – Dirac (analytical) and its dependence on temperature – Fermi energy – density of states – derivations for current density.

BAND THEORY OF SOLIDS: Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of materials into conductors, semi – conductors & insulators – Concepts of effective mass of electron - concept of hole.

UNIT – VI

SEMICONDUCTOR PHYSICS:

Objective: In the wake of ever increasing demand for the space and power the watch word "small is beautiful", understanding the physics of electronic transport as underlying mechanism for appliances would provide a knowledge base.

Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion – Einstein's equation – Hall Effect – direct & indirect band gap semiconductors – Electronic transport Mechanism for LEDs, Photo conductors and solar cells.

TEXT BOOKS:

1. Solid state Physics by A.J. Dekker (Mc Millan India Ltd.) .
2. A text book of Engineering Physics by M.N. Avadhanulu & P.G. Kshirasagar (S. Chand publications).
3. Engineering Physics b;y M.R. Srinivasan (New Age international publishers).

REFERENCE BOOKS:

1. 'Introduction to solid state physics' by Charles Kittle (Willey India Pvt. Ltd).
2. 'Applied Physics' by T. Bhimasenkaram (BSP BH Publications)
3. 'Applied Physics' by M.Arumugam (Anuradha Agencies)
4. 'Engineering Physics' by Palanisamy (Scitech Publishers)
5. 'Engineering Physics' by D.K.Bhattacharya (Oxford University press).
6. 'Engineering Physics' by Mani Naidu S (Pearson Publications)
7. 'Engineering Physics' by Sanjay D Jain and Girish G Sahasrabudhe (University Press).
8. 'Engineering Physics' by B.K.Pandey & S. Chaturvedi (Cengage Learning).