PHYSICS FOR ELECTRONICS & COMMUNICATION ENGINEERING (ECS-112)

1. **SEMICONDUCTOR DEVICE PHYSICS**: Energy bands in solids, the E-k diagram, Density of states, Occupation probability, Fermi level and quasi Fermi levels, Fermi-Dirac Statistic, Effective mass, Conductivity as a function of temperature p-n junctions, Schottky junction and Ohmic contacts, Semiconductor optoelectronic materials, Bandgap modification, Heterostructures and Quantum Wells.

2. **MAGNETIC AND DIELECTRIC PROPERTIES OF MATERIALS**: Origin of magnetism, dia, Para, Ferro, antiferro and ferrimagnetisms, soft and hard magnetic materials, dielectric properties, Piezo, pyro and Ferro electricity.

3. **STRUCTURE OF MATERIALS**: Space lattice and unit cells, crystal system, Symmetry operation, Structures of common metallic, Semiconductor ceramic and, Miller Indices, Packing fractions, Structure determination using X-ray diffraction, Braggs law, and lattice parameter determination. Bonding in solids, coordination number, ceramics, silicates and clay structures, glass transition temperature, non-crystalline materials.

4. **INTERACTION OF PHOTONS WITH MATERIALS**: Rates of emission and absorption, spontaneous and stimulated emission, Condition for amplification by stimulated emission, the laser amplifier, characteristics of laser light, three and four level laser system, coherence,Ruby, He-Ne, CO2 and semiconductor lasers. Optical Fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, applications of optical fibers.

5. **SUPERCONDUCTIVITY**: Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type -I and type-II superconductors, Isotope effect, BCS theory of superconductivity, flux quantization, SQUIDS, applications of superconductivity.

TEXT / REFERENCES BOOKS:

1. J.Singh, Semiconductor Optoelectronics:Physics and Technology, McGraw-Hill Inc. (1995)
2. Introduction to Solid State Physics, C. Kittel.
3. Solid State Physics, N.W. Ashcroft and N.D. Mermin.
4. A text Book of Engineering Physics; M.N. Avadhanulu and P.G. Kashirsagar, S. Chand & Co. Ltd.
5. Modern Engineering Physics; A.s. Vasudeva, S. Chand & Co. Ltd.
6. Optical Electronics; AK Ghatak and Thyagarajan, Foundation Books, New Delhi.
7. Concepts of modern Physics; Arthur and Beiser, McGraw Hill Publication.
8. Optical Fiber Communication and Technology, D.K. Mynbaev and L.L.Scheiner, Pearson Education