MES-122

Physics for Mechanical Engineering

L	T	P/D	Cr
3	1	0	3

1. **Lasers** : Concept of masers and laser, spontaneous and stimulated emission, elementary idea about lasers, basic principles involved in laser, three and four level laser system, coherence, characteristics of laser light, types of lasers: Ruby, He-Ne, CO_2 and semiconductor lasers, application of lasers.
2. **Fiber Optics**: Optical fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, sources and sensors for optical fibers, applications of optical fibers in communication.
3. **Electrostatics and Electrodynamics**: Gauss's law in dielectric medium, Equation of continuity, displacement currents, Maxwell's equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector, Vector potential, Lorentz gauge.
4. **Mechanics and Theory of Relativity** : Displacement, velocity and acceleration in polar and spherical coordinate systems, inertial and non-inertial frames, Michelson and Morley experiment, postulates of special theory of relativity, Lorentz's space - time transformations and their consequences, velocity transformations, mass variation with velocity, mass energy equivalence, momentum and energy transformations.
5. **Quantum Mechanics** : Need of quantum mechanics, Compton effect, Born's concept of wave function, eigen function and eigen values, operators in quantum mechanics, expectation values, time independent and time - dependent Schrodinger's wave equations and its applications viz., particle in one dimensional potential well, particle in three dimensional well, rectangular potential barrier, quantum mechanical tunneling and its applications
6. **Superconductivity**: Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type-I and type-II superconductors, Isotope effect, theory of superconductivity, flux quantization, SQUIDS, applications of superconductivity.
7. **Ultrasonic**: Ultrasonic waves, methods of their generation & detection, properties and applications of ultrasonic waves.
8. Specific cases of Applications to mechanical engineering

Books

1. A Text Book of Engineering Physics : M. N. Avadhanulu & P. G. Kashirsagar
2. Engineering Physics : Satya Prakash and Vibhav Saluja
3. Modern Engineering Physics : A. S. Vasudeva
4. Optical Electronics : AK Ghatak and Thyagarajan
5. Electromagnetic Theory and Electrodynamics : Satya Prakash
7. Introduction to Electrodynamics : David J Griffithsi
8. Concepts of Modern Physics : Arthur and Beiser
9. Optical Fibers Communication and Technology : D.K.Mynbaev and L.L.Scheiner