ENGINEERING PHYSICS - I

Lectures	: 3 periods / week	Sessional Marks	: 40
Tutorials	: 1 period / week	Semester End Exam Marks	: 60
Semester End Exam	: 3 hrs	Credits	: **3**

Course objectives:

- õ The production & detection of ultrasonics and its applications are presented to emphasise in understanding the medical ultrasound techniques. Superposition principle of light waves and its applications in thin films (wedge, convex shaped) are used to find the various parameters.
- õ For the identification of various vibrational modes of atoms of molecules in materials by laser Raman spectroscopy and in the study of mechanical strains and in the studies of crystals, polarized light and diffraction phenomena can effectively be used and hence presented.
- õ The basics of laser light, its properties with applications in various fields and its important role played in the preparation of holograms, in analysing the optical spectra and in optical communication are presented.
- õ An overview of Maxwell's E-M equations here to understand all the problems encountered in Electromagnetism and the connection to the Optics. The free electron theory and its significance to characterize the electrical and thermal properties of solids and the concept of the Fermi-Dirac distribution function to explain the Fermi energy level in metals.

Course Outcomes:

The students will be able to understand:

- The production of ultrasonics by piezoelectric method and detection by acoustic grating method.
- The usage of pulse echo technique in various fields of science, engineering & medicine was understood.
- The basics of interference due to division of amplitude in thin films and its technological applications.
- To recognize the experimental evidence for the wave nature of light.
- To understand how and why interference of light waves occurs.
- To understand the conditions for constructive and destructive interference in thin films.
- To study the spreading of waves due to diffraction.
- To understand how light diffracts through single slit.
- To understand how diffraction limits the resolution of optical instruments.
- Preparation and working theory of plane transmission grating.
- Types of polarised light, concept of double refraction
- Principle, construction & uses of nicol prism.
- Amplification of light radiation due to stimulated emission, properties of laser beam and various types of lasers when active media changed and their applications.
- Recording and reproduction method of 3D images.
- Transmission of information through various types of optical wave guides and their applications.

- The ideas of different (classical & quantum) and the distribution functions, the concept of photon & electron gas.

Unit –I

Ultrasonics:

production of ultrasonics by magnestriction, piezo electric oscillator methods, detection by acoustic grating method, applications in engineering and medicine, ultrasonic testing methods (pulse echo technique, ultrasonic imaging).

Interference:

superposition principle, young's double slit experiment (qualitative treatment), stoke's principle (change of phase on reflection), interference in thin films due to reflected light (Cosine law), theory of air wedge (fringes produced by a wedge shaped thin film) and theory of newton's rings(reflected system), non-reflecting films.

Unit-II

Diffraction:

Fraunhofer diffraction due to a single slit(quantitative), theory of plane transmission diffraction grating, Rayleigh's criterion, resolving power & dispersive power of a grating.

Polarization:

introduction, double refraction, construction and working of a nicol prism, nicol prism as a polarizer and analyser, quarter wave plate, production and detection of circular and elliptical polarizations(qualitative), optical activity, specific rotation, kerr and faraday effects.

Unit-III

Lasers:

Laser characteristics, spontaneous and stimulated emissions, population inversion, pumping, active system, gas (He-Ne) laser, Nd: YAG laser and semiconductor (GaAs) laser, applications of lasers.

Holography:

Basic principle, recording, reproduction and applications.

Fiber optics:

Structure of optical fiber, light propagation through optical fiber-numerical aperture, acceptance angle and acceptance cone, types of optical fibers, fiber optics in communication system and applications of optical fibres.

Unit-IV

Electromagnetism:

induced electric fields, displacement current and conduction current, Maxwell's equation – qualitative (differential & integral forms)-significance, LC oscillations (quantitative), velocity of electromagnetic wave equation in free space , poynting vector.

Statistical Physics:

Phase space, Maxwell-Boltzmann, Fermi-Dirac & Bose-Einstein's distribution functions (qualitative), photon gas & electron gas.

TEXT BOOKS

1. Engineering Physics – R .K. Gaur & S. L. Gupta , Danpati Rai Publications, Delhi, 2001.

2. Engineering Physics – Hitendra K. Malik & A.K.Singh, Tata MacGraw Hill, New Delhi,2009.

REFERENCE BOOKS

1. Fundamentals of Physics – Resnick & Halliday, John Wiley sons ,9th Edition.
2. Engineering Physics – M.N. Avadhanulu & P.G. Kshirasagar, S.Chand & Co.Ltd , 7th Edition.
3. Engineering Physics – M.Arumugam, Anuradha Publications, Chennai ,5th Edition , 2006.
4. Engineering Physics – B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.

WEB REFERENCES:

http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/engg_physics/index_cont.htm :
www.rvrjcce.ac.in/moodle/first year/2011-12/engineering physics