Phys 1002	WAVES AND OPTICS	(CR3)
Preq.	FSc/A-Level (Physics) or equivalent	

Objectives

To introduce the ideas of harmonic motion in depth and concept of waves in physics with spcial attention on light waves.

Syllabus

Oscillations, simple and damped harmonic oscillations, Mass-spring system, Simple harmonic oscillator equation, Simple pendulum, Forced damped harmonic oscillations and Resonance. Waves, Transverse Standing Waves, Normal Modes, General Time Evolution of a Uniform String, Phase velocity, Group Velocity, Longitudinal Waves, Traveling waves, wave equation, Standing waves in a Finite Continuous Medium, Traveling waves in an infinite continuous medium, Electromagnetic waves. Doppler effect of sound waves. Optics, Propagation of Light and Image Formation: Huygens' Principle, Fermat's Principle, Laws of Reflection and Refraction, Refraction at a spherical surface, Thin Lenses, Newtonian Equation for a thin lens. Optical Instruments including simple magnifiers, Telescopes and microscopes, Chromatic and monochromatic aberrations, Spherical Aberrations. Superposition and Interference: Standing waves, Beats, Phase and group velocities, Two-beam and Multiple-beam interference, Michelson and Fabry-Perot interferometers, resolving power. Fraunhofer Diffraction: Diffraction from multiple slits, Diffraction grating, Dispersion. Polarization: Jones Matrices, Production of polarized light, description of polarization states, Dichroism, Brewster's law, Birefringence, Double refraction. Coherence and Holography: Temporal Coherence, Spatial Coherence, Holography.

Recommended Books

1. *The Physics of Vibrations and Waves, by J. Pain, Wiley, (6th edition) (2005).*
2. *A studen's guide to waves, D. Fleish, and L. Kinnaman, Cambridge, (2015).*
3. *Vibrations and Waves, by P. French, CBS Publishers (2003).*
4. *Waves and Oscillations, by F. S. Crawford, Jr., Berkeley Physics Course, McGraw-Hill, (1968).*
5. *Physics Vol. I & II by Resnick, Halliday and Krane, 5th Edition, Wiley, (2002).*
6. *Introduction to Optics, by F. Pedrotti, L. S. Pedrotti and L. M. Pedrotti, Pearson, 3rd edition (2007).*
7. *Optics, by E. Hecht and A. Ganesan, Dorling Kindersley, 4th edition (2008).*
8. *Optics: Principles and Applications, by K. K Sharam, Academic Press, (2006).*