PHY 1001	Engineering Physics	L,T,P	4

Objective

Engineering Physics is a course for the students to

- learn the basics of physics for engineering
- apply them to explore natural phenomenon,
- Learn experimentation and contemporary issues.

The course will train the students to understand and investigate the real world scientific phenomena.

Expected outcome

- To understand the fundamental laws of physics and apply natural sciences.
- To know the concepts and phenomena in the fields of lasers, nano-science, optical fibers and semiconductor.
- To improve problem solving skills by conceptual approach
- To explore the theories of physics to intuitive concepts.

Unit	Topics	Lec	SLO
1	**Mechanics** Newton's laws, Applying Newton's law, Frames of Reference-inertial frame of reference and non-inertial frame of reference, Fundamental Forces and Friction, Gravity, Work and energy, conservation laws, Pseudo forces, rigid body dynamics, Torque and Angular momentum, Impulse, Fixed axis rotation, Dynamics of fixed axis rotation– Problem solving.	9	a,b,e
2	**Quantum Physics:** Failure of classical mechanics, Planck's law (qualitative), quantum concept, de Broglie waves and properties, Heisenberg Uncertainty Principle, Wave function, and Schrodinger equation (time dependent & independent), Operators- energy and momentum operators, Particle in a 1-D box (Eigen Value and Eigen Function), Tunneling Effect (Qualitative), Scanning Tunneling Microscope, Problem solving.	9	a,b
3	**Nanophysics:** Introduction- atom-molecule-solid, Nano-materials, Moore's law, Properties of Nano-materials, Quantum confinement, Quantum well, wire & dot, Carbon Nano-tubes, Applications of nanotechnology in industry, Problem solving.	6	a,b,j
4	**Laser :** Laser Characteristics, Einstein Coefficient & its significance, Population inversion, Two, three & four level	8	

	systems, Pumping schemes, Threshold gain coefficient, Components of laser, He-Ne, CO_2, direct & indirect bandgap semiconductor, semiconducting laser and their engineering applications, Problem solving.		a,b,e
5.	**Electromagnetic wave and Optical fibres**: Physics of Divergence, Gradient and Curl, Maxwell Equations (Qualitative), EM waves, EM-Wave Equation (Derivation), Poynting theorem, Light propagation through fibers, Acceptance angle, Numerical Aperture, Types of fibers - step index, graded index, single mode & multimode, Attenuation, Dispersion-intermodal and intramodal. Laser diode(source), PIN diode(photo detector), Applications of fiber optics in industry- Endoscopy, Problem solving.	9	a,b,d,e
7	**Contemporary Topics & Guest Lectures**	2	j,k
	Total Lectures	43	

Text Books	
1	Classical Mechanics, Herbert Goldstein, 3rd Edition, Addison- Wesley, (2002).
2	Mechanics, Keith R. Symon, 3rd Edition, Addison- Wesley, (1971)
3	Concepts of Modern Physics, Arthur Beiser et al., Sixth Edition, Tata McGraw Hill (2013).
4	Laser Fundamentals, William T. Silfvast, Cambridge University Press (2008).
5	Introduction to Electrodynamics, D. J. Griffith, 3rd Edition (2013).
6	Fiber Optic Communication Technology, Djafar K. Mynbaev and Lowell L.Scheiner, Pearson (2011)
Reference Books	
1	Modern Physics, Raymond A. Serway, Clement J. Mosses, Curt A. Moyer, Cengage learning [3rd Indian Edition], 2010
2	Modern Physics, Kenneth Krane, Wiley Indian Edition, 2010
3	Laser Systems and Applications, Nityanand Choudhary and Richa Verma, PHI Learning Private Ltd., 2011
4	Fundamental Physics, Halliday – Resnick, 8th Edtion, Weiley (2009)
5	Nano: The Essentials, T. Pradeep, McGraw Hill (2008)
Indicative list of experiments	
	1. Experimental verification of Newton's second law 2. Determination of Plank's constant using LED's 3. Experimental verification of Heisenberg's Uncertainty principle. 4. Measuring numerical aperture of an optical fibre 5. Measure the distance between tracks of CD/DVD 6. Measurement of wavelength of He-Ne Laser by using grating. 7. Particle size determination. 8. Band gap determination

	9. Photo electric effect 10. Black Body radiation	
Recommendation by the board of studies		5/5/17
Approved by ACM		7/9/17
ACM With Minor changes BOS		22/11/18
Moderated by		