

Course No.	Course Name	L-T-P-Credits	Year of Introduction
PH100	ENGINEERING PHYSICS	3-1-0-4	2016
<b>Course Objectives</b> Most of the engineering disciplines are rooted in Physics. In fact a good engineer is more or less an applied physicist. This course is designed to provide a bridge to the world of technology from the basics of science and to equip the students with skills in scientific inquiry, problem solving, and laboratory techniques.			
<b>Syllabus</b> Harmonic Oscillations: Damped and Forced Harmonic Oscillations. Waves: One Dimensional and Three Dimensional waves, Interference: Interference in thin films (Reflected system) Diffraction: Fraunhofer and Fresnel Diffraction, Grating, Polarization of Light: Double refraction, production and detection of polarized light, Superconductivity: Properties and Applications. Quantum Mechanics: Schrodinger Equations- Formulation and Solution, Operators, Applications. Statistical Mechanics: Microstates and macro states Maxwell - Boltzmann, Bose-Einstein and Fermi Dirac statistics. Fermi level and its significance. Acoustics: Intensity of sound, Reverberation and design concepts, Ultrasonics: Production, Detection and Applications, NDT methods, Lasers: Properties, Working Principles, Practical Lasers. Photonics: Basics of Solid State lighting, Photo detectors, Solar Cells, Fiber Optics.			
<b>Expected outcome</b> Familiarity with the principles of Physics and its significance in engineering systems and technological advances.			
<b>References:</b> <ul style="list-style-type: none"> <li>• Aruldas, G., Engineering Physics, PHI Ltd.</li> <li>• Beiser, A., Concepts of Modern Physics, McGraw Hill India Ltd.</li> <li>• Bhattacharya and Tandon, Engineering Physics , Oxford India</li> <li>• Brijlal and Subramanyam, A Text Book of Optics, S. Chand &amp; Co.</li> <li>• Dominic and Nahari, A Text Book of Engineering Physics, Owl Books Publishers</li> <li>• Hecht, E., Optics, Pearson Education</li> <li>• Mehta, N., Applied Physics for Engineers, PHI Ltd</li> <li>• Palais, J. C., Fiber Optic Communications, Pearson Education</li> <li>• Pandey, B. K. and Chaturvedi, S., Engineering Physics, Cengage Learning</li> <li>• Philip, J., A Text Book of Engineering Physics, Educational Publishers</li> <li>• Premlet, B., Engineering Physics, Mc GrawHill India Ltd</li> <li>• Sarin, A. and Rewal, A., Engineering Physics, Wiley India Pvt Ltd</li> <li>• Sears and Zemansky, University Physics , Pearson</li> <li>• Vasudeva, A. S., A Text Book of Engineering Physics, S. Chand &amp; Co</li> </ul>			

**Web:**

[www.physics.org](http://www.physics.org)

[www.howstuffworks.com](http://www.howstuffworks.com)

[www.physics.about.com](http://www.physics.about.com)

### Course Plan

Module	Contents	Hours	Sem. Exam Marks
<b>I</b>	Harmonic Oscillations: Differential equation of damped harmonic oscillation, forced harmonic oscillation and their solutions- Resonance, Q factor, Sharpness of resonance- LCR circuit as an electrical analogue of Mechanical Oscillator (Qualitative)	5	15%
	Waves: One dimensional wave - differential equation and solution. Three dimensional waves - Differential equation & its solution. (No derivation) Transverse vibrations of a stretched string.	4	
<b>II</b>	Interference: Coherence. Interference in thin films and wedge shaped films (Reflected system) Newton's rings-measurement of wavelength and refractive index of liquid Interference filters. Antireflection coating.	5	15%
	Diffraction Fresnel and Fraunhofer diffraction. Fraunhofer diffraction at a single slit. Plane transmission grating. Grating equation - measurment of wavelength. Rayleigh's criterion for resolution of grating- Resolving power and dispersive power of grating.	4	
<b>FIRST INTERNAL EXAM</b>			
<b>III</b>	Polarization of Light: Types of polarized light. Double refraction. Nicol Prism. Quarter wave plate and half wave plate. Production and detection of circularly and elliptically polarized light. Induced birefringence- Kerr Cell - Polaroid & applications.	4	15%
	Superconductivity: Superconducting phenomena. Meissner effect. Type-I and Type-II superconductors. BCS theory (qualitative). High temperature superconductors - Applications of superconductors.	5	
<b>IV</b>	Quantum Mechanics: Uncertainty principle and its applications- formulation of Time dependent and Time independent Schrödinger equations- physical meaning of wave function- Energy and momentum Operators-Eigen values and functions- One dimensional infinite square well potential .Quantum mechanical Tunnelling (Qualitative)	6	15%
	Statistical Mechanics: Macrostates and Microstates. Phase space. Basic postulates of Maxwell- Boltzmann, Bose-Einstein and Fermi Dirac	3	



	statistics, Distribution equations in the three cases (no derivation). Fermi Level and its significance.		
<b>SECOND INTERNAL EXAM</b>			
V	Acoustics: Intensity of sound- Loudness-Absorption coefficient - Reverberation and reverberation time- Significance of reverberation time- Sabine's formula (No derivation) -Factors affecting acoustics of a building.	3	20%
	Ultrasonics: Production of ultrasonic waves - Magnetostriction effect and Piezoelectric effect - Magnetostriction oscillator and Piezoelectric oscillator - Detection of ultrasonics - Thermal and piezoelectric methods- Applications of ultrasonics - NDT and medical.	4	
VI	Laser: Properties of Lasers, absorption, spontaneous and stimulated emissions, Population inversion, Einstein's coefficients, Working principle of laser,Optical resonant cavity. Ruby Laser, Helium-Neon Laser, Semiconductor Laser (qualitative). Applications of laser, holography (Recording and reconstruction)	5	20%
	Photonics: Basics of solid state lighting - LED – Photodetectors - photo voltaic cell, junction & avalanche photo diodes, photo transistors, thermal detectors, Solar cells- I-V characteristics - Optic fibre-Principle of propagation-numerical aperture-optic communication system (block diagram) - Industrial, medical and technological applications of optical fibre. Fibre optic sensors - Basics of Intensity modulated and phase modulated sensors.	5	
<b>END SEMESTER EXAM</b>			

