

Course code	Course title	L	T	P	C
BPHY101L	Engineering Physics	3	x	x	3
Pre-requisite	12 th of equivalent	Syllabus version			
		v. 01.00			
Course Objectives					
1. To explain the dual nature of radiation and matter.					
2. To apply Schrödinger's equation to solve finite and infinite potential problems and apply quantum ideas at the nanoscale.					
3. To understand the Maxwell's equations for electromagnetic waves and apply the concepts to semiconductors for engineering applications.					
Course Outcome					
At the end of the course the student will be able to					
1. Comprehend the phenomenon of waves and electromagnetic waves.					
2. Understand the principles of quantum mechanics.					
3. Apply quantum mechanical ideas to subatomic domain.					
4. Appreciate the fundamental principles of a laser and its types.					
5. Design a typical optical fiber communication system using optoelectronic devices.					
Module:1	Introduction to waves	7 hours			
Waves on a string - Wave equation on a string (derivation) - Harmonic waves- reflection and transmission of waves at a boundary - Standing waves and their eigenfrequencies - waves with dispersion - Superposition of waves and Fourier method (qualitative) - Wave packet - phase velocity and group velocity.					
Module:2	Electromagnetic waves	7 hours			
Physics of divergence - gradient and curl - surface and volume integral - Maxwell Equations (Qualitative) - Continuity equation for current densities - Displacement current - Electromagnetic wave equation in free space - Plane electromagnetic waves in free space - Hertz's experiment.					
Module:3	Elements of quantum mechanics	7 hours			
Need for Quantum Mechanics: Idea of Quantization (Planck and Einstein) - Compton effect (Qualitative) – de Broglie hypothesis - justification of Bohr postulate - Davisson-Germer experiment - Wave function and probability interpretation - Heisenberg uncertainty principle - Gedanken experiment (Heisenberg's microscope) - Schrödinger wave equation (time dependent and time independent).					
Module:4	Applications of quantum mechanics	6 hours			
Eigenvalues and eigenfunction of particle confined in one dimensional box - Basics of nanophysics - Quantum confinement and nanostructures - Tunnel effect (qualitative) and scanning tunneling microscope.					
Module:5	Lasers	6 hours			
Laser characteristics - spatial and temporal coherence - Einstein coefficients and their significance - Population inversion - two, three and four level systems - Pumping schemes - threshold gain coefficient - Components of a laser - He-Ne, Nd:YAG and CO ₂ lasers and their engineering applications.					
Module:6	Propagation of EM waves in optical fibers	5 hours			
Introduction to optical fiber communication system - light propagation through fibers - Acceptance angle - Numerical aperture - V-parameter - Types of fibers – Attenuation - Dispersion-intermodal and intramodal. Application of fiber in medicine - Endoscopy.					
Module:7	Optoelectronic devices	5 hours			
Introduction to semiconductors - direct and indirect bandgap – p-n junction, Sources: LED and laser diode, Photodetectors: PN and PIN					
Module:8	Contemporary Topics	2 hours			
Guest lectures from Industry and, Research and Development Organisations					

	Total Lecture hours:	45 hours
Text Book(s)		
1.	H. D. Young and R. A. Freedman, University Physics with Modern Physics, 2020, 15 th Edition, Pearson, USA.	
2.	D. K. Mynbaev and Lowell L. Scheiner, Fiber Optic Communication Technology, 2011, Pearson, USA	
Reference Books		
1.	H. J. Pain, The Physics of vibrations and waves, 2013, 6 th Edition, Wiley Publications, India.	
2.	R. A. Serway, J. W. Jewett, Jr, Physics for Scientists and Engineers with Modern Physics, 2019, 10 th Edition, Cengage Learning, USA.	
3.	K. Krane, Modern Physics, 2020, 4 th Edition, Wiley Edition, India.	
4.	M.N.O. Sadiku, Principles of Electromagnetics, 2015, 6 th Edition, Oxford University Press, India.	
5.	W. Silfvast, Laser Fundamentals, 2012, 2 nd Edition, Cambridge University Press, India.	
Mode of Evaluation: Written assignment, Quiz, CAT and FAT		
Recommended by Board of Studies		26-06-2021
Approved by Academic Council		No. 62
Date	15-07-2021	