Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
BS22	Applied Physics II	L	T	P	L	T	P	Total
		3	-	-	3	-	-	3
		Examination Scheme						
		ISE		MSE		ESE		
		10		30		100 (60% weightage)		

COURSE OBJECTIVE:

To make learners aware about the role and relevance of physics in engineering and technology.

Pre-requisite Course Codes		HSC level physics
After successful completion of the course, student will be able to		
Course Outcomes	C01	Comprehend the interference in thin films and Fraunhofer diffraction
	C02	Illustrate the principle, construction and working of various lasers and its applications
	C03	Explain the basics of fibre optics and its applications in optical fibre technology
	C04	Demonstrate the basic knowledge of quantum mechanics
	C05	Derive Maxwell's equations using the concepts of electrodynamics
	C06	Comprehend the significance of nanoscience and nanotechnology and its applications

Module No.	Module Name	Unit no.	Topics	Ref.	Hrs.
1	Interference and Diffraction	1.1	Interference by division of amplitude and division of wavefront; Thin film interference - interference in thin films of constant thickness due to reflected and transmitted light, origin of colours in thin films, interference in thin films of non-constant thickness (wedge-shaped) due to reflected light, formation of Newton's rings Applications of interference – testing of surface flatness, determination of thickness of thin wire, refractive index of a liquid, wavelength of incident light, radius of curvature of a lens; Anti-reflection coating, Highly reflecting films	2,3,4	07
		1.2	Fraunhofer diffraction at a single slit, Fraunhofer diffraction at a double slit, Fraunhofer diffraction due to N slits; Diffraction grating - Plane transmission grating	2,3,4	04
		1.3	Rayleigh's criterion, resolving power of a diffraction	2,3,4	02

			grating, dispersive power of a diffraction grating; determination of wavelength of light using a plane transmission grating		
2	LASER	2.1	Processes - Absorption of light, spontaneous emission, stimulated emission; Einstein's equations Population inversion; metastable states; pumping and pumping schemes; optical resonance cavity	2,4	03
		2.2	Solid state laser – Ruby and Nd:YAG laser, Gas laser – Helium Neon laser, semiconductor laser; Applications of laser in industry, medicine and holography. (construction & reconstruction of holograms)	2,4	03
3	Fibre Optics	3.1	Total internal reflection, critical angle; optical fibre – construction and types; Numerical aperture, cone of acceptance; V-number, number of modes of propagation	2,4	03
		3.2	Losses in optical fibre – attenuation and dispersion; Applications – optical fibre communication link, optical fibre sensors, medical applications	2,4	01
4	Quantum Mechanics	4.1	Introduction to quantum mechanics, Wave particle duality, de Broglie wavelength; experimental verification of de Broglie theory; wave packet, group velocity and phase velocity; Wave function, Physical interpretation of wave function; Heisenberg's uncertainty principle; Electron diffraction experiment; Applications of uncertainty principle	1,2	04
		4.2	Schrodinger's time dependent wave equation, time independent wave equation; Application of time-independent Schrodinger equation - Particle trapped in one dimensional box and Potential barrier	1,2	03
5	Electromagnetism	5.1	Coulomb's law; divergence and curl of electrostatic field; continuous charge distribution; application of Gauss' law for spherical symmetry	2,5	03
		5.2	Divergence of magnetic induction, Biot-Savart law; Ampere's circuit law; Faraday's law of emf; Maxwell's equations	2,5	04
6	Nanotechnology	6.0	Introduction to nanotechnology; important tools in nanotechnology – SEM, TEM, AFM; Applications of nanomaterials	2	02
				Total	39

References:

[1] Beiser Arthur, "Concepts of Modern Physics", 6th ed, McGraw Hill Education, 2009.
[2] Bhattacharya D K and Tandon, "Engineering Physics", 1st ed, New Delhi, Oxford Press, 2015.
[3] Halliday and Resnick, "Fundamentals of Physics", 10th ed, Wiley, 2013.
[4] Ghatak A, "Optics", 5th ed, McGraw Hill Education, 2012.
[5] Griffiths D, "Introduction to Electrodynamics", 4th ed, Pearson Education, 2015.