

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI
COURSE PLAN June - November 2024

Department : PHYSICS
Name/s of the Faculty : Dr. D. Anceila
Course Title : Optics and Spectroscopy
Course Code : 23PH/MC/OS34
Shift : I

COURSE OUTCOMES (COs)

COs	Description	CL
CO1	recall the basics of various phenomena in geometrical, wave optics and spectroscopy.	K1
CO2	understand the behavior of light in different mediums, origin of spectra and characterization techniques.	K2
CO3	examine the differences in the important phenomena namely interference, diffraction and Polarization and properties of spectra, and apply the knowledge in day-to-day life.	K3
CO4	explain the theory of optical systems and the methods to minimize aberrations and to illustrate the theory associate with IR and NMR.	K4
CO5	develop problem solving Skill in optics by selecting the appropriate equations and performing numerical or analytical calculations and to relate the principle of optics in IR and NMR spectroscopy.	K5

Week	Unit No.	Content	Cognitive Level	Teaching Hours	COs	Teaching Learning Methodology	Assessment Methods
Jun 19 – 26, 2024 (Day Order 1 - 6)	1	1.1 Fermat's principle of least time – importance of Fermat's principle in relation to the main postulates of geometrical optics – rectilinear propagation of light reversibility of the path of the rays of light	1-5	5	1-5	Lecture, PPT	
Jun 27 – July 4, 2024 (Day Order 1 - 6)	1	1.1 the laws of reflection and refraction of light. Huygen's principle of wavefront propagation and its limitations.	1-5	5	1-5	Lecture, PPT, Group discussion	quiz
July 5 – 12, 2024 (Day Order 1 - 6)	1	1.2 Thick lenses – focal length , critical thickness , power and cardinal points of a thick lens -Lens aberrations: monochromatic aberrations	1-5	5	1-5	Lecture, PPT, Problem Solving	

July 15 – 23, 2024 (Day Order 1 - 6)	1	Spherical aberration – Coma - Astigmatism - Curvature of the field – Distortion – Chromatic aberrations - Methods of minimizing aberrations. Eyepieces: Advantage of an eyepiece over a simple lens – Huygen’s eyepiece Prism: Dispersion - Angular dispersion - Achromatic combination of prisms (deviation without dispersion) - Dispersion without deviation	1-5	5	1-5	Lecture, PPT presentation, Problem Solving	
July 24 – 31, 2024 (Day Order 1 - 6)	2	2.1 Huygen’s principle of wavefront propagation and its limitations. 2.2 Division of wave front: Fresnel’s biprism – Theory Fringes with white light - Division of amplitude : Interference in thin films due to reflected light – Colours of thin films - Newton’s rings – Theory.	1-5	5	1-5	Lecture, PPT, Demonstration	Component Test I Theory Test Unit 1 and Unit 2 K1, K2, K3 assessment
Aug 1 – 5, 2024 (Day Order 1 - 3)	2	2.3 Interferometers: Michelson’s Interferometer – Determination of the wavelength of a monochromatic source of light.	1-5	5	1-5	Lecture, PPT, Demonstration, Problem Solving	

Aug 6 – 10, 2024	C.A. Test – I						
Aug 12 – 14, 2024 (Day Order 4-6)	3	3.1 Fresnel’s assumptions – Zone plate - Action of zone plate for an incident spherical wave front- Differences between a zone plate and a convex lens.	1-5	5	1-5	Lecture, PPT	
Aug 16 – 23, 2024 (Day Order 1-6)	3	3.2 Fresnel type of diffraction: Diffraction pattern due to a straight edge – Positions of maximum and minimum intensities – Diffraction due to a narrow slit. Fraunhofer type of diffraction: Fraunhofer diffraction at a single slit- Plane diffraction grating – Theory- Experiment to determine wavelengths – Width of principal maxima.	1-5	5	1-5	Lecture, PPT, Demonstration, Problem Solving	Short test
Aug 27 – Sep 3, 2024 (Day Order 1-6)	3	3.3 Resolving power of optical instruments: Rayleigh’s criterion for resolution – Limit of resolution for the eyeresolving power of (i) telescope (ii) grating.	1-5	5	1-5	Lecture, PPT, Problem Solving	Component Test 2 Problem Test- K 5 Assessment

Sep 4 – 11, 2024 (Day Order 1-6)	4	4.1 Double Refraction - optic axis principal plane – Huyghen’s explanation of double refraction in uniaxial crystals. 4.2 Elliptically and circularly polarized light – Quarter wave plate - half wave plate	1-5	5	1-5	Lecture, PPT, Group Discussion	
Sep 12 - 20, 2024 (Day Order 1-6)	4	4.2 Production and detection of circularly polarized light and elliptically polarized light. Optical activity- Fresnel’s explanation – Specific rotation – Laurent half shade polarimeter - Experiment to determine specific rotatory power.	1-5	5	1-5	Lecture, Demonstration, Problem Solving	Model Making Component – K 5 assessment
Sep 23 - 26, 2024 (Day Order 1-4)	5	5.1 Characteristics of electromagnetic spectrum – The quantization of energy	1-5	5	1-5	Lecture, PPT, Group Discussion	
Sep 27 – Oct 3, 2024	C.A. Test – II						
Oct 4 – 5, 2024 (Day 5 & 6)	5	5.1 Regions of the spectrum – Representation of spectra – Basic elements of practical spectroscopy.	1-5	5	1-5	Lecture, PPT, Group Discussion	

Oct 7 - 15, 2024 (Day Order 1 to 6)	5	5.2 Infra-Red Spectroscopy - Properties - Origin of Infra-Red spectra - IR spectrophotometer.	1-5	5	1-5	Lecture, PPT	quiz
Oct 16 - 22, 2024 (Day Order 1 to 6)	5	5.3 Nuclear Magnetic Resonance – Introduction – Theory - Experimental arrangement - Application in inorganic chemistry - Chemical shift.	1-5	5	1-5	Lecture, PPT, Demonstration video	
Oct 23 - 24, 2024 (Day Order 1 to 2)	REVISION						