

BANKURA CHRISTIAN COLLEGE

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

DEPARTMENT OF ELECTRONICS

ACADEMIC YEAR 2024-'25 (6th Semester) (January to July)

Prepared by: Dr. Arindam Sen, Associate Professor, Dept. of Electronics

Course Title: Photonics

Course Learning Objectives:

- To understand light as an electromagnetic wave and various phenomenon like interference, diffraction and polarization.
- Interaction between a photon and electron and its relevance to laser and various other optoelectronic devices.
- Understand the propagation of wave in optical fibre

Course Learning Objectives: At the end of this course, students will be able to

- CO1: Describe optics and simple optical systems.
- CO2: Understand the concept of light as a wave and the relevance of this to optical effects such as interference and diffraction and hence to lasers and optical fibers.
- CO3: Use mathematical methods to predict optical effects e.g. light-matter interaction, interference, fiber optics, geometrical optics

MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
March 2023	2	a. Light as an Electromagnetic Wave b. Plane waves in homogeneous media c. Concept of spherical waves
	3	a. Reflection and transmission at an interface, b. Total internal reflection, c. Brewster's Law
	4	a. Interaction of electromagnetic waves with dielectrics b. Origin of refractive index c. Dispersion
	5	a. Concept of Interference b. Superposition of waves of same frequency c. Concept of coherence
MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
April 2023	1	a. Interference by division of wavefront b. Young's double slit experiment c. Interference by Division of Amplitude
	2	a. Interference in thin film b. Anti-reflecting films c. Newton's rings
	3	a. Concept of Diffraction b. Huygen's Principle c. Fresnel and Fraunhofer approximations
	4	a. Fraunhofer Diffraction by single slit, rectangular aperture, double slit, b. Diffraction grating c. To determine the resolving power and Dispersive power of Diffraction Grating (Practical)

	5	a. Resolving power and Dispersive power b. Linear, circular and elliptical polarization
MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
May 2023	1	a. Polarizer-analyzer and Malus' law b. Double refraction by crystals c. Interference of polarized light
	2	a. Wave propagation in uni-axial media b. Half wave and quarter wave plates c. Faraday rotation and electro-optic effect d. To determine the specific rotation of scan sugar using polarimeter (Practical)
	3	a. Light Emitting Diodes: Construction, materials and operation. b. Einstein coefficients c. Condition for amplification
	4	a. Photodetectors: Bolometer, Photo multiplier tube, Charge Coupled Device. Phototransistors and Photodiodes (p-i-n, avalanche), b. Quantum efficiency and Responsivity c. To determine characteristics of LEDs and Photo- detector (Practical)
	5	a. LCD Displays: Types of liquid crystals b. Principle of Liquid Crystal Displays c. Applications and advantages over LED displays d. Class Test
MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
June 2023	1	a. Guided Waves and the Optical Fiber b. TE and TM modes in symmetric slab waveguides
	2	a. Effective index, b. Field distributions c. Dispersion relation and Group Velocity
	3	a. Step index optical fiber b. Total internal reflection
	4	Concept of linearly polarized waves in the step index circular dielectric waveguides
	5	a. single mode and multi mode fibers b. Class Test
MONTH/YEAR	WEEK	TOPICS TO BE TAUGHT
July 2023	1	a. Attenuation and dispersion in optical fiber b. Solution of numerical problems
	2	
	3	
	4	
	5	

Suggested Books:

1. Wilson and J. F. B. Hawkes, *Optoelectronics: An Introduction*, Prentice Hall India (1996)
2. S. O. Kasap, *Optoelectronics and Photonics: Principles and Practices*, Pearson Education (2009)
3. A.K. Ghatak. and K. Thyagarajan, *Introduction to fiber optics*, Cambridge Univ. Press. (1998)