

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
DESIGN AND MANUFACTURING (IIITDM) KANCHEEPURAM

INTRODUCTION OF NEW COURSE

Course Title	Introduction to Photonics	Course No	ELE5XXX			
Specialization	ECE	Structure (LTPC)	3	1	0	4
To be offered for	UG / PG	Status	Core <input type="checkbox"/>		Elective	
Faculty Proposing the course	Dr. Srijith K	Type	New		Modification	
Date of DAC	23.04.2020	Members Present in DAC	All faculty members of the Dept.			
		External Member:	Prof. Balaji Srinivasan, IITM Prof. Deepa Venkitesh, IITM			
Pre-requisite	CoT	Submitted for approval	42 nd Senate			
Learning Objectives	This course is intended to be an introductory level course in Photonics which can lead to more advanced courses such as Fiber optic communication, Photonic Sensors and Nanophotonics.					
Learning Outcomes	<p>At the end of the course, the learners are expected to do the following:</p> <ul style="list-style-type: none"> • To describe the fundamental principles of photonics and light matter interactions • To apply the principles of generation and detection of photons in various problems related to photonic structures/processes and analyze them. • To understand processes that help to manipulate the fundamental properties of light. 					
Contents of the course (With approximate break-up of hours)	<p>Ray Optics, Wave Optics and Statistical Optics - Review of ray optics - paraxial approximation, introduction to matrix approach. Review of wave optics - interference of waves - Statistical properties of light - Spatial and Temporal coherence, Mutual coherence function - Properties of Gaussian beams (10)</p> <p>Photon properties - mean photon flux, number of photons, probability of finding a photon - Interaction of photons with atoms - absorption/emission processes - Spontaneous/stimulated emission - Optical amplification - Resonator - Laser fundamentals - output power/spectrum (10)</p> <p>Semiconductor photon sources and detectors - Interaction of photons with charge carriers - LEDs - output power, spectrum, modulation characteristics - Laser diodes - threshold condition, L-I characteristics, longitudinal modes, modulation bandwidth - Photodiodes - Responsivity, bandwidth - PIN and APD - gain and noise characteristics (12)</p> <p>Manipulation of photons - Faraday effect - Basic principles of Electro optics - Nonlinear optics - Stimulated Raman and Brillouin scattering (10)</p>					
Text Books	1. Saleh and Teich, Fundamentals of Photonics, 2 nd Ed., Wiley Publishers, 2007.					
Reference Books	<ol style="list-style-type: none"> 1. J.M. Liu, Principles of Photonics, Cambridge University Press, 2016. 2. Ben G Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, 6th Ed., Prentice Hall India Learning Pvt. Ltd, 2006. 3. A. Yariv and P. Yeh, Photonics, 6th Ed., Oxford University Press, 2006. 4. Ajoy Ghatak, Optics, 6th Ed., Mc Graw Hill Publication, 2016. 5. Eugene Hecht and A R Ganesan, Optics, 4th Ed., Pearson Education, 2008. 					