

Course Code	18ECE322T	Course Name	OPTOELECTRONICS	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	18ECC102J	Co-requisite Courses	Nil	Progressive Courses	Nil	
Course Offering Department	Electronics and Communication Engineering		Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:	Learning			Program Learning Outcomes (PLO)																	
CLR-1 :	Identify the working and nature of optical wave		1	2	3	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLR-2 :	Identify the working and nature of optical semiconductors		H	H	-	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	PLO -1 : Professional Achievement		
CLR-3 :	Analyze the working principles of different photonic sources		H	H	H	-	-	-	-	-	-	-	-	-	-	-	M	L	-	H	PLO -2 : Project Management Techniques		
CLR-4 :	Analyze the working principles of different photonic detectors		H	H	H	-	-	-	-	-	-	-	-	-	-	-	M	L	-	H	PLO -3 : Analyze & Research		
CLR-5 :	Create knowledge about various optoelectronic applications		H	H	-	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-			
CLR-6 :	Familiarize the concepts of optoelectronic integrated circuits		H	H	H	-	-	-	-	-	-	-	-	-	-	-	M	-	-	H			

Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:	2	85	80	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Review the basics of optics, optical semiconductors		2	85	80	H	H	-	-	-	-	-	-	-	-	-	M	-	-	-
CLO-2 :	Understand the working principle of different photonic sources		4	85	75	H	H	H	H	-	-	-	-	-	-	-	M	L	-	H
CLO-3 :	Familiarize the principle and operation of various detectors		4	85	75	H	H	H	H	-	-	-	-	-	-	-	M	L	-	H
CLO-4 :	Acquire knowledge of various optoelectronic modulators and switches		4	80	70	H	H	-	-	-	-	-	-	-	-	-	M	-	-	-
CLO-5 :	Explore the concepts of optoelectronic integrated circuits and components		4	80	70	H	-	H	-	-	-	-	-	-	-	-	M	L	-	-
CLO-6 :	Design and analyze the working of different components in optical system and use it for various applications.		4	80	70	H	H	H	H	-	-	-	-	-	-	-	M	-	-	H

Duration (hour)	WAVE NATURE OF LIGHT AND SEMICONDUCTOR OPTICS	SEMICONDUCTOR PHOTON SOURCES AND DISPLAY DEVICES	SEMICONDUCTOR PHOTON DETECTORS	OPTOELECTRONIC MODULATORS, INTERCONNECTS AND SWITCHES	OPTOELECTRONIC INTEGRATED CIRCUITS (OEIC) AND APPLICATIONS
	9	9	9	9	9
S-1	SLO-1 Light Waves In A Homogeneous Medium- Plane electromagnetic wave, Maxwell's wave equation	LED Principles- Homojunction LED, Heterostructure LED	Principle of Photo Detection	Electro-Optic Modulator: Principles, Electro optic effect	Introduction
	SLO-2 Refractive Index And Dispersion- Sellmeier equation and diamond, Cauchy equation and diamond	Quantum Well High Intensity LEDs	The PIN Photodiode	Single waveguide electro optic modulators	Need For Integration
S-2	SLO-1 Polarization Of Light	LED Materials and Structures	Avalanche Photodiode- Principles, Structures	Dual channel waveguide electro optic modulator	Slab and stripe waveguides
	SLO-2 Snell's law and Total internal reflection	LED Efficiencies and Luminous Flux	Responsivit, Efficiency	Electro optic modulator employing reflection or Diffraction	Basic IO structural elements
S-3	SLO-1 Reflection And Refraction	Manufacturing Process and Applications	Heterojunction Photodiodes	Integrated Optical Modulators: Phase and polarization modulation	IO devices: Optical disk read head
	SLO-2 Solving problems	Solving Problems	Schottky Junction Photodetectors	Mach Zehnder modulator, Coupled waveguide modulator	OIC temperature sensor
S-4	SLO-1 Superposition And Interference Of Waves	LASER: Threshold Condition	Solving problems	Acousto-Optic Modulator: Principles, Acousto optic effect, Raman nath and Bragg type modulators	IO high voltage sensor
	SLO-2 Diffraction Principles- Fraunhofer diffraction, Diffraction Grating	Emission and Absorption of Radiation	Solving problems	Performance characteristics, Acousto optic frequency shifters	IO chemical sensor

<b>S-5</b>	<b>SLO-1</b>	Overview Of Semiconductors	Population Inversion	Metal-Semiconductor, Metal Photodiode	Solving problems	IO wavelength meters and spectrum analyzers
	<b>SLO-2</b>	Interaction of Photons With Charge Carriers	Principle of the Laser Diode	Phototransistors	Solving problems	RF Spectrum Analyzer
<b>S-6</b>	<b>SLO-1</b>	Hole Pair Formation And Recombination	Heterostructure Laser Diodes	Array Detectors	Faraday Rotation	Monolithic Wavelength-Multiplexed Optical Source
	<b>SLO-2</b>	Absorption In Semiconductors	Device Fabrication	Photoconductive detectors	Optical Isolators	Analog-To-Digital Converter
<b>S-7</b>	<b>SLO-1</b>	Effect Of Electric Field On Absorption	Solving problems	Noise In Photodetectors	Nonlinear Optics	Integrated-Optic Doppler Velocimeter
	<b>SLO-2</b>	Absorption In Quantum Wells	Display Device: Photo Luminescence	Noise In Photodetectors	Second Harmonic Generation	Guided Wave Devices
<b>S-8</b>	<b>SLO-1</b>	Radiation In Semiconductors	Cathode Luminescence, Electro Luminescence	Solving problems	Optical Interconnects	Guided Wave Devices
	<b>SLO-2</b>	Solving Problems	Injection Luminescence	Solving problems	Optical gates	OEIC: Transmitter
<b>S-9</b>	<b>SLO-1</b>	Heterojunctions	Plasma Displays	Charge Coupled Devices (CCD)	Photonic Switches	OEIC: Receiver
	<b>SLO-2</b>	Heterojunctions	LCD, Numeric Displays	Charge Coupled Devices (CCD)	Solving problems	OEIC phased array antenna driver

<b>Learning Resources</b>	1. Kasap, "Optoelectronics & Photonics: Principles & Practices", 2nd edition, Pearson Education, 2013. 2. Pallab Bhattacharya "Semiconductor Optoelectronic Devices", 2nd Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2009. 3. B. E. A. Saleh and m.c. Teich, "Fundamentals Of Photonics," 2nd edition, John Wiley & Sons, Inc. 2007.	4. Robert G. Hunsperger, "Integrated Optics- Theory And Technology", Springer, 2009 5. J. Wilson and J F B Hawkes "Optoelectronics- An Introduction", 3rd edition, Pearson Education Taiwan Ltd, 2010. 6. A Ghatak and K Thyagarajan, "Introduction to Fiber Optics", Cambridge University Press 2006.
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Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
	CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1  Remember Understand	40%	-	40%	-	35%	-	35%	-	40%	-
	40%	-	40%	-	35%	-	35%	-	40%	-
Level 2  Apply Analyze	40%	-	40%	-	35%	-	35%	-	40%	-
	20%	-	20%	-	30%	-	30%	-	20%	-
Total	100 %		100 %		100 %		100 %		100 %	

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
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