

Course Code	21ECC304T	Course Name	MICROWAVE AND OPTICAL COMMUNICATION	Course Category	C	PROFESSIONAL CORE	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	21ECC302T	Progressive Courses	Nil
Course Offering Department	ECE	Data Book / Codes / Standards	Nil		

Course Learning Rationale (CLR):		The purpose of learning this course is to:												Program Outcomes (PO)												Program Specific Outcomes		
CLR-1:	deliver in depth knowledge on microwave transmission and generation	Engineering Knowledge	Problem Analysis	Design/development of solutions	Conduct investigations of complex problems	Modern Tool Usage	The engineer and society	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO-1	PSO-2	PSO-3												
CLR-2:	propose efficient methods to analyze S-parameters of microwave devices																											
CLR-3:	explore detailed awareness on measurement techniques and to provide complete knowledge on the techniques with associated equipment																											
CLR-4:	offer complete information on light transmission through optical fiber and their mechanism and characterization																											
CLR-5:	acquire detailed understanding on the methodologies and design considerations of link power budget in optical communication system and to grant mathematical formulation																											
Course Outcomes (CO):		At the end of this course, learners will be able to:																										
CO-1:	familiarize the concept of microwave transmission and generation	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-												
CO-2:	realize systematic methods to design, analyze S-parameters of microwave devices	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-												
CO-3:	identify different measurement techniques for determining various parameters and to gain knowledge on microwave measurements and the techniques with associated equipment	2	-	-	3	-	-	-	-	-	-	-	-	3	-	-												
CO-4:	discover complete information on the fundamentals of light transmission through fiber and their characterization and mechanism	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-												
CO-5:	recognize the link power budget design considerations of optical communication system	3	-	2	-	-	-	-	-	-	-	-	-	-	2	-												

<b>Unit-1 - Introduction to Microwaves and Sources</b>	<b>9 Hour</b>
History of Microwave Engineering, Microwave transmission and Applications, Microwave Tubes, Klystron amplifier, Reflex Klystron oscillators, Magnetron oscillators, IMPATT, TRAPATT, Tunnel diode, Gunn diode.	
<b>Unit-2 - S Parameters Analysis for N-port Microwave Devices</b>	<b>9 Hour</b>
Scattering parameter, Directional coupler, E plane, H plane and Magic Tee Junctions, Microwave Circulators, Isolators, Phase shifters, Attenuators and Power dividers. Case study on Directional coupler	
<b>Unit-3 - Microwave Measurements</b>	<b>9 Hour</b>
Impedance and Power measurement, Measurement of Frequency, Attenuation, Scattering parameters, Vector Network Analyzer, Signal Analyzer and Spectrum Analyzer Case study on VSWR and Impedance measurement	
<b>Unit-4 - Optical Fiber Communication Systems</b>	<b>9 Hour</b>
Introduction to Optical fiber communication, Ray theory transmission, Optical fiber modes and configurations, Fiber attenuation and dispersion mechanisms, Optical sources-LED and LASER Diode, Optical detectors-PIN and Avalanche photo diode	
<b>Unit-5 - Optical Link Power Budget Analysis</b>	<b>9 Hour</b>
Digital link-Point-to-Point link -System considerations, Link power budget and Risetime budget, Analog link and analysis, WDM and Passive devices, Case study on Point-to-Point link power budget analysis	

<b>Learning Resources</b>	1. Samuel Y. Liao, "Microwave Devices and Circuits", 3rd Edition, Pearson Education, 2013.	5. Keiser G, "Optical Fiber Communication Systems", 5th Edition, 6th Reprint, McGraw Hill Education (India), 2015.
	2. Robert. E. Collin, "Foundations for Microwave Engineering", 2nd edition, Wiley, Reprint 2014.	6. John M. Senior, "Optical fiber Communications: Principles and Practice", Pearson Education, 3rd Edition, 2009.
	3. Annapurna Das, Sisir K. Das, "Microwave Engineering", 3rd Ed., McGraw Hill, 2015.	7. Vivekanand Mishra, Sunita P. Ugale, "Fiber Optic Communication: Systems and Components", Wiley-India, 1st edition, 2013
	4. David M. Pozar, "Microwave Engineering", 4th Edition, John Wiley & Sons, 2012	

Learning Assessment							
	Bloom's Level of Thinking	Continuous Learning Assessment (CLA)					
		Formative CLA-1 Average of unit test (50%)		Life-Long Learning CLA-2 (10%)		Summative Final Examination (40% weightage)	
		Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	15%	-	15%	-	15%	-
Level 2	Understand	25%	-	25%	-	25%	-
Level 3	Apply	30%	-	30%	-	30%	-
Level 4	Analyze	30%	-	30%	-	30%	-
Level 5	Evaluate	-	-	-	-	-	-
Level 6	Create	-	-	-	-	-	-
	Total	100 %		100 %		100 %	

Course Designers		
Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
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