

MOHAMMED SATHAK A J COLLEGE OF ENGINEERING													
Siruseri IT park, OMR, Chennai - 603103													
LESSON PLAN													
Department of <u>Electronics and Communication Engineering</u>													
Name of the Subject	OPTICAL COMMUNICATION						Regulation	2017					
Subject Code	EC8751						Year / Sem	IV/VII					
Academic Year	AY 2022-2023						Batch	2019-2023					
Course Objective													
To Facilitate the knowledge about optical fiber sources and transmission techniques													
To Facilitate the knowledge about Signal degradation of optical fiber													
To Facilitate the knowledge about fiber optic coupling													
To know optical receiver performance													
To Enrich the idea of optical fiber networks algorithm such as SONET/SDH and optical CDMA.													
Course Outcome													
At the end of the course, the students should be able to:													
CO1: Fundamental concept of optical fiber modes and their configurations.													
CO2: Analyse the various signal degradation factors associated with optical fiber.													
CO3: Explain the various optical sources and optical detectors and their use in the optical communication system.													
CO4: Describe the techniques required to measure the optical fiber systems.													
CO5: Analyse the Digital Transmission and its associated parameters on system performance													
Lesson Plan													
Sl. No.	Topic(s)	T / R*	Periods Required	Mode of Teaching (BB / PPT / NPTEL / MOOC / etc)	Blooms Level (L1-L6)	CO	PO						
		Book											
UNIT I INTRODUCTION TO OPTICAL FIBERS													
1	Evolution of fiber optic system- Element of an Optical Fiber Transmission link	T1	1	BB,PPT	L1	CO1	PO1,PO12,PO6, PO12						
2	Total internal reflection-Acceptance angle	T1,T2	1	BB	L2	CO1	PO1-PO3,PO4						
3	Numerical aperture – Skew rays Ray Optics-	T1	1	BB,NPTEL	L2	CO1	PO1-PO3						
4	Optical Fiber Modes and Configurations	T1	1	BB,PPT	L2	CO1	PO1-PO3						
5	Mode theory of Circular Wave guides	T1,T2	1	BB,PPT	L2	CO1	PO1-PO3						
6	Overview of Modes-Key Modal concepts	T1	1	BB,PPT	L3	CO1	PO1-PO3						
7	Linearly Polarized Modes	T1	1	BB,PPT	L2	CO1	PO1-PO3						
8	Single Mode Fibers	T1,T2	1	BB,PPT	L2	CO1	PO1,PO2						
9	Graded Index fiber structure.	T1	1	BB,PPT	L2	CO1	PO1,PO2						
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any													
Assignment : Optical fiber system													
Evaluation method : Assignment papers collected													
UNIT II TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER													
10	Attenuation - Absorption losses, Scattering losses	R1	1	BB	L2	CO2	PO1-PO3,PO6						
11	Bending Losses, Core and Cladding losses,	R1	1	BB	L2	CO2	PO1-PO6,PO12						
12	Signal Distortion in Optical Wave guides	R1	1	BB	L2	CO2	PO1,PO2						
13	Information Capacity determination	R1	1	BB	L2	CO2	PO1-PO3						
14	Group Delay-Material Dispersion, Wave guide Dispersion	R1	1	BB	L4	CO2	PO1-PO3,PO4						
15	Signal distortion in SM fibers	R1	1	BB,PPT	L2	CO2	PO1-PO3,PO4						
6	Polarization Mode dispersion	R1	1	BB,PPT	L2	CO2	PO1-PO3						
17	Intermodal dispersion, Pulse Broadening in GI fibers- Mode Coupling	R1	1	BB	L2	CO2	PO1-PO3						
18	Design Optimization of SM fibers-RI profile and cut-off wavelengthdispersion calculation-mode field diameter	R1	1	BB	L3	CO2	PO1-PO4						
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any													
Quiz : Quiz from signal degradation of fibers is given													
Evaluation method : Team of students combined and asked to perform quiz													

UNIT III OPTICAL SOURCES AND DETECTORS							
19	Direct and indirect Band gap materials-LED structures	T1	1	BB,NPTEL	L2	CO3	PO1,PO2
20	Light source materials –Quantum efficiency and LED power	T1	1	PPT	L2	CO3	PO1-PO3,PO4,PO6
21	Modulation of a LED, lasers Diodes-Modes and Threshold condition	T1	1	PPT	L4	CO3	PO1-PO3,PO6
22	Rate equations -External Quantum efficiency	T1	1	PPT	L2	CO3	PO1-PO3
23	Resonant frequencies -Laser Diodes, Temperature effects	T1,R1	1	PPT	L2	CO3	PO1-PO2,PO6,PO12
24	, Introduction to Quantum laser, Fiber amplifiers-	T1	1	PPT	L2	CO3	PO1-PO3
25	, Fiber splicing-Signal to Noise ratio	T1	1	BB	L2	CO3	PO1-PO3
26	Detector response time.Avalanche multiplication noise-temperature effects	T1,R1	1	BB	L2	CO3	PO1-PO3
27	Comparison of photo detectors	T1	1	BB	L3	CO3	PO1-PO3,PO4
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any							
case studies: about performance of optical sources							
Evaluation method : case studies can be submitted by students							
UNIT IV OPTICAL RECEIVER, MEASUREMENTS AND COUPLING							
28	Fundamental receiver operation, Pre amplifiers	T1	1	BB	L2	CO4	PO1-PO2,PO6
29	Error sources – Receiver Configuration–	T1,T2	1	BB	L2	CO4	PO1-PO3
39	Probability of Error	T1,R1	1	PPT	L3	CO4	PO1-PO3,PO4
31	– Quantum limit.Fiber Attenuation measurements	T2	1	PPT	L3	CO4	PO1-PO3,PO4
32	Dispersion measurements	T2	1	PPT	L3	CO4	PO1-PO3
33	Fiber Refractive index profile measurements	T2	1	BB	L3	CO4	PO1-PO3,PO4
34	MeasurementsLencing schemes	T2	2	PPT	L2	CO4	PO1-PO3
35	–MeasurementsPower Launching and coupling, Fiber -to-Fiber joints,	T2,R1		BB	L4	CO4	PO1-PO3,PO4
36	Fiber diameter measurements,fiber splicing and connectors	T2	1	PPT	L3	CO4	PO1-PO3
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any							
Quiz: optical receiver performance							
Evaluation method : MCQ Quiz							
UNIT V OPTICAL COMMUNICATION SYSTEMS AND NETWORKS							
37	System design consideration Point – to –Point link design	R1	1	BB	L1	CO5	PO1,PO2,PO6,PO12
38	–Link power budget –rise time budget	R1	1	BB	L2	CO5	PO1,PO2
39	WDM –Passive DWDM Components	R1	1	BB	L2	CO5	PO1,PO2,PO12
40	Elements of optical networks	R1	1	PPT	L3	CO5	PO1-PO3
41	SONET/SDH	R1	1	PPT	L2	CO5	PO1-PO3
42	Optical Interfaces	R1	1	BB	L2	CO5	PO1,PO2,PO12
43	SONET/SDH Rings and Networks	R1	1	BB	L2	CO5	PO1,PO2
44	High speed light wave Links	T1	1	BB	L3	CO5	PO1-PO3
45	OADM configuration-Optical ETHERNET-Soliton.	T1	1	BB	L2	CO5	PO1,PO2
Suggested Activity: Assignment / Case Studies / Tuorials/ Quiz / Mini Projects / Model Developed/others Planned if any							
Quiz: Quiz on optical networks							
Evaluation method: Individual quiz sheets collected							
Content Beyond the Syllabus Planned							
1	Updated network Algorithm						
2	Degradation techniques in optical fiber						
Text Books							
1	P Chakrabarti, "Optical Fiber Communicationl, McGraw Hill Education (India)Private Limited, 2016 (UNIT I, II, III)						
2	Gred Keiser,"Optical Fiber Communicationl, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013. (UNIT I, IV, V)						
Reference Books							
1	John M.Senior, —Optical fiber communicationl, Pearson Education, second edition.2007						
2	Rajiv Ramaswami, —Optical Networks — , Second Edition, Elsevier , 2004						
3	J.Gower, —Optical Communication Systeml, Prentice Hall of India, 2001						
4	Govind P. Agrawal, —Fiber-optic communication systemsl, third edition, John Wiley & sons, 2004						

Website / URL References														
1	https://nptel.ac.in/courses/117/104/117104127/													
2	https://nptel.ac.in/courses/108/104/108104113/													
3	https://youtu.be/AEklPwPOYI8													
4	https://youtu.be/9oYuk66fjiY													
5	https://youtu.be/aralHQ33PB4													
Blooms Level														
Level 1 (L1) : Remembering			Lower Order Thinking	Fixed Hour Exams	Level 4 (L4) : Analysing					Higher Order Thinking	Projects / Mini Projects			
Level 2 (L2) : Understanding					Level 5 (L5) : Evaluating									
Level 3 (L3) : Applying					Level 6 (L6) : Creating									
Mapping syllabus with Bloom's Taxonomy LOT and HOT														
Unit No	Unit Name			L1	L2	L3	L4	L5	L6	LOT	HOT	Total		
Unit 1	INTRODUCTION TO OPTICAL FIBERS			1	7	1	0	0	0	9	0	9		
Unit 2	TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER			0	7	1	1	0	0	8	1	9		
Unit 3	OPTICAL SOURCES AND DETECTORS			0	7	1	1	0	0	8	1	9		
Unit 4	OPTICAL RECEIVER, MEASUREMENTS AND COUPLING			0	3	5	1	0	0	8	1	9		
Unit 5	OPTICAL COMMUNICATION SYSTEMS AND NETWORKS			1	6	2	0	0	0	9	0	9		
Total				2	30	10	3	0	0	42	3	45		
Total Percentage				4.44	66.67	22.22	6.67	0.00	0.00	93.33	6.67	100.00		
CO PO Mapping														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	0	0	0	1	0	0	0	0	0	1	1	0
CO2	3	2	1	1	0	0	0	0	0	0	0	1	1	0
CO3	3	2	1	0	0	1	0	0	0	0	0	1	1	0
CO4	3	3	1	1	0	0	0	0	0	0	0	0	1	0
CO5	3	2	0	0	0	1	0	0	0	0	0	1	1	0
Avg	3	2.2	0.6	0.4	0	0.6	0	0	0	0	0	0.8	1	0
Justification for CO-PO mapping														
CO1	Various fundamental key elements related to optical fiber are described Highly in PO1 .Medium correlation of Different concepts of mode theory of waveguides are being analyzed to produce engineering solutions in optical field PO2. Socital need and reasonable learning is required PO6,PO12.													
CO2	Strong correlation for PO1,Medium correlation PO2, Less correlation for PO3 is given as the CO2 can be used to apply knowledge of engineering to Identify , formulate ,design and solve the problems.Less tools usage PO5 .Socital need and reasonable learning is required PO6,PO12.													
CO3	Strong correlation for PO1,Medium correlation PO2, Less correlation for PO3,PO4 is given as the CO3 can be used to apply knowledge of engineering to Identify , formulate ,design and solve the problems.Less tools usage PO5 .Socital need and reasonable learning is required PO6,PO12.													
CO4	Strong correlation for PO1,Medium correlation PO2, Less correlation for PO3,PO4 is given as the CO4 can be used to apply knowledge of engineering to Identify , formulate ,design and solve the problems.Less tools usage PO5 .Socital need and reasonable learning is required PO6,PO12.													
CO5	Strong correlation for PO1,Medium correlation PO2, Less correlation for PO3,PO4 is given as the CO5 can be used to apply knowledge of engineering to Identify , formulate ,design and solve the problems.Socital need and reasonable learning is required PO6,PO12.													
3		High level			2		Moderate level			1		Low level		
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Name & Sign of Subject Expert :														
Head of the Department : Dr.M.Sivakumar														
Format No :231														