Ramgarhia Polytechnic College, Phagwara

Electronics and Communication Engineering Department

Head of Department:	Er. Simranjit Singh
Name of the Faculty:	Er. Pooja Verma
Discipline:	ECE
Semester:	5th
Subject:	Optical Fibre Communication
Lesson Plan Duration:	16 Weeks

RATIONALE

Progressing from communication over copper wire to today's fibre opticcommunication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical

communication. This subject will provide basic concepts and requisite knowledge and skill required.

Learning Outcomes

CO1. Set up a fiber analog link and optic digital link
CO2. Measure bending losses in optical fibers
CO3. Measure the splice or connector loss
CO4. Measure and calculate numerical aperture of optical fiber
CO5. Explain and demonstrate characteristics of optical source and optical detector
CO6. Connect a fiber with connector at both ends
CO7. Identify and demonstrate use of various components and tools used in optical fiber communication

PO ⇨ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2							
CO3							
CO4							
CO5							
CO6							
CO7							

Syllabus

Units	Details	Hours
1.	Introduction Historical perspective, basic communication systems, optical frequency range, advantages of optical fibre communication, application of fibre optic communication Electromagnetic spectrum used, Advantages and disadvantages of optical communication. Principle of light penetration, reflection, critical angle.	(12 hrs)
2.	Optical Fibers and Cables Constructional details of various optical fibers, multimode and monomode fibers, step index and graded index fibers, acceptance angle and types of optical fiber cables. Optical Fibers cable connectors and splicing techniques	(08 hrs)
3.	Losses in Optical Fiber Cable: a) Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending loses. b) Dispersion: Types and its effect on data rate. c) Testing of losses using OTDR(Optical Time Domain Reflectometer)	(08 hrs)
4.	Optical Sources Characteristics of light used in optical communication, principle of operation of LED, different types of LED structures used and their brief description, Injection laser diode, principle of operation, different injection laser diodes, comparison of LED and ILD.	(10 hrs)
5.	Optical Detectors Characteristics of photo detectors used in optical communication; PIN diode and avalanche photo diode (APD), Noise in detectors	(08 hrs)
6.	Optical Amplifiers Types of optical amplifiers, semiconductor & fiber optical amplifiers Functional types, principal of operation of SOA, types of SOA. FPA, TWA, SOA applications, advantages, Drawbacks, EDFAS, Raman amplifiers	(10 hrs)
7.	Optical Fiber System Application FTTx(Fiber to the x, NGN(Next Generation Network), NFS(Need for Spectrum), IOT(Internet of Things), Apparel Technology.	(08hrs)

Reference Books:

1. Optical Fiber Communication by Sangar and Sahdev, Uneek Publications, Jalandhar

2. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi

3. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi

Delivery/Instructional Methodologies

Sr.No.	Description
1.	Chalk and Talk
2.	PowerPoint Presentation

Assessment Methodologies

Sr. No.	Description	Type
1.	Student Assignment	Direct
2.	Test	Direct
3.	Board Examination	Direct
4.	Student Feedback	Direct

Gaps in the syllabus - to meet industry/profession requirements

S.NO.	DESCRIPTION	PROPOSED ACTIONS	PO MAPPING
	N/A	N/A	N/A

Topics beyond syllabus/advanced topics

Units	Details	Hours
N/A	N/A	N/A

Web Source References

Sr. No.	URL
1.	https://nptel.ac.in/

Lesson Plan

Week	Theory		Practical	
	Lecture Day		Practical Day	
1st	1st	Historical perceptive of optical fiber communication	1.	Setting up of fiber analog link
	2nd	Chronologial Development of optical fiber communication		
	3rd	Explaination of basic communication system		
	4th	Advantages of optical fiber communication.		
2nd	5th	Discussion of disadvantages of optical fibres along with applications.	2.	Setting up of fiber analog link
	6th			
	7th	Explaination of typical fibre cable construction		
	8th	Explaination of principle of light penetration in optical fibre along with concepts of refraction , total internal reflection and refractive index		
3rd	9th		3.	Setting up of optic digital link
	10th			
	11th			
	12th	Electromagnetic spectrum used in optical fibres.		
4th	13th	Optical fibre transmission windows	4.	Measurement of bending losses in optical fibers
	14th	Explaination of single mode fibres working along with its advantages and disadvantages		
	15th			

	16th	Multimode fibres (step index)		
5th	17th	Multimode fibres(graded index)	5.	To observe and measure the splice or connector loss
	18th	Advantages of multi mode graded index fibre over multi mode step index fibre.		
	19th			
	20th	Acceptance angle and connectors and splicing		
6th	21st	Losses in optical fibres introduction ,attenuation	6.	To measure and calculate numerical aperture of optical fiber
	22nd	Instrinsic losses and their causes.		
	23rd	**REVISION**		
	24th	**1st Sessional Test (Tentative)**		
7th	25th	Extrinsic losses and their causes.	7.	Revised 4th & 5th Practical
	26th	Scattering losses and its types		
	27th	Bending losses		
	28th	Dispersion and ISI		
8th	29th	Basics about LED &LD stimulated and spontaneous emission.	8.	To observe characteristics of optical source
	30th	Basic structure of LED with its characterstics		
	31st	Working principle of LED ,its types and advantages		
	32nd			
9th	33rd	Laser diode structure	9.	To observe characteristics of
	34th	Working of laser diode		
	35th			

		Light detection,optical detectors		optical detector
	36th	Types of optical detectors Types of photon detectors		
10th	37th	Types of noises in optical detector & Avalanche diode	10.	Revised 6th & 7th Practical
	38th	Photon detector Thermal detector		
	39th			
	40th	Pin Diode		
11th	41st	Optical Amplifiers Types of optical amplifiers	11.	To splice the available optical fiber
	42nd	semiconductor & fiber optical amplifiers Functional types		
	43rd	principal of operation of SOA, types of SOA.., advantages,		
	44th			
12th	45th	NGN(Next Generation Network)	12.	To connect a fiber with connector at both ends
	46th	NFS(Need for Spectrum		
	47th	Revision		
	48th	Class test		
13th	49th	Optical Fiber System Application	13.	Revised 8th & 9th Practical
	50th			
	51st	FTTx(Fiber to the x		
	52nd	NFS(Need for Spectrum		
14th	53rd	IOT(Internet of Things), Apparel Technology.	14	
	54th	Revision		

	55th	Class test		Demonstration of various components and tools used in optical fiber communication
	56th	Revision		
15th	57th	FPA, TWA, SOA application	15.	PRACTICAL PERFORMANCE TEST
	58th			
	59th	Drawbacks, EDFAS, Raman amplifiers		
	60th			
16th	61st	**SEMINAR**	16.	PRACTICAL PERFORMANCE TEST
	62nd	**PTM**		
	63rd	**REVISION**		
	64th	**3rd Sessional Test (Tentative)**		