



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Electronics & Communication (Communication System Engineering)

Course / Subject Code : ME01000321

Course / Subject Name : Optical Networks

w. e. f. Academic Year:	2024-25
Semester:	1 <sup>st</sup> Semester
Category of the Course:	PEC

<b>Prerequisite:</b>	Digital Communications, Computer Networks
<b>Rationale:</b>	The course provides thorough knowledge of different optical networks and their practical implementations. The course also describes present optical fiber systems which carry enormous amount of information as a broadband backbone network, handle a wide variety of signals and provide improved reliabilities and ease of use.

## Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the concept of WDM thoroughly and international telecom standards.	U
02	Analyze the functions of network elements and network design issues.	N
03	Evaluate the advantages of optical networks over wireless networks.	E
04	Understand the routing in optical networks.	U
05	Implement simple optical network and understand further technology developments for future enhanced network.	C

\*Revised Bloom's Taxonomy (RBT)

## Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA / CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150



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## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	<b>SONET/SDH:</b> optical transport network, IP, routing and forwarding, multiprotocol label switching.	6	15
2.	<b>WDM network elements:</b> optical line terminals and amplifiers, optical add/drop multiplexers, OADM architectures, reconfigurable OADM, optical cross connects.	9	20
3.	<b>Control and management:</b> network management functions, optical layer services and interfacing, performance and fault management, configuration management, optical safety.	9	20
4.	<b>Network Survivability:</b> protection in SONET/SDH & client layer, optical layer protection schemes.	6	15
5.	<b>WDM network design:</b> LTD and RWA problems, dimensioning wavelength routing networks, statistical dimensioning models.	6	10
6.	<b>Access networks:</b> Optical time division multiplexing, synchronization, header processing, buffering, burst switching, test beds, Introduction to PON, GPON, AON.	9	20
<b>Total</b>		<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	20	20	10

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

1. Rajiv Ramaswami, Sivarajan, Sasaki, "Optical Networks: A Practical Perspective", MK, Elsevier, 3rd edition, 2010.
2. C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks: Concepts Design, and Algorithms", PHI, EEE, 2001.
3. Optical WDM Networks by Biswanath Mukherjee, Springer



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**(b) Open source software and website:**

1. Scilab toolbox for fiber optic communication systems
2. <https://nptel.ac.in>

**Suggested Course Practical List: (30 Hours)**

Experiments based on simulation of networks with power budget analysis.

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