

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ELECTRONICS & COMMUNICATION (WIRELESS COMMUNICATION TECHNOLOGY) (44)

### OPTICAL NETWORKS AND PHOTONIC SWITCHING

**SUBJECT CODE: 2724409**

M. E. Semester – II

**Type of course:** Elective

**Prerequisite:** Fundamental knowledge of Optical Communication System is necessary,

**Rationale:** The course provides good knowledge of different optical networks and the mechanism to obtain the same. The course also describes present optical fiber to carry out more messages, handle a wide variety of transmission types and provide improved reliabilities and ease of use.

#### Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	2#	2	5	70	30	20	10	10	10	150

#### Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<b>Introduction:</b> Introduction, Telecom Network Overview, Telecom Business Models, Roles of Three Fields in Optical Networking, TE vs. NE vs. NP, Wavelength-Division Multiplexing (WDM), ITU Wavelength Grid, WDM Networking Evolution. SONET/SDH, ESCON, HIPPI	5	5-8
2	<b>WDM Network Elements:</b> Optical Line Terminals, Optical Line Amplifiers, Optical Add/Drop Multiplexers, OADM Architectures, Reconfigurable OADMs, Optical Cross connects, All-Optical OXC Configurations.	6	12-14
3	<b>WDM Network Design:</b> Cost Trade-Offs: A Detailed Ring Network Example, LTD and RWA Problems, Routing and Wavelength Assignment.	5	12-14
4	<b>Optical Access Networks:</b> Introduction, Overview of PON Technologies, Ethernet PON (EPON) Access Network, Fiber to the Curb (FTTC).	5	10-12
5	<b>Routing and Wavelength Assignment:</b> Introduction, Fixed Routing, Fixed-Alternate Routing, Adaptive Routing, Fault-Tolerant Routing, Wavelength-Assignment Sub problem (Heuristics) .	6	12-14
6	<b>Wavelength Conversion:</b> Introduction, Need for Wavelength Conversion, Wavelength Converters, Switches, Network Design, Control and Management Issues.	5	12-14
7	<b>Optical Multicasting:</b>	4	10-12

	Introduction, Multicast routing problem, node architectures, Multicast tree generation, Different types of tree generation.		
<b>8</b>	<b>Photonic Switching:</b> Introduction ,Optical Circuit switching, Optical burst switching, Optical Packet Switching (OPS) Basics, Header and Packet Format, Typical Contention Resolution in OPS Networks, Test beds KEOPS, NTT's Optical ATM switches, BT Labs, AON, CORD.	<b>6</b>	12-15

### Reference Books:

1. Optical Networks: A Practical Perspective (Third Edition) by Rajiv Ramaswami and Kumar N. Sivarajan, Elsevier Publication.
2. Optical WDM Networks by Biswanath Mukherjee, Springer.
3. WDM Optical Networks by C. Siva Ram Murthy, PHI Publication.

### Course Outcome:

After learning the course the students should be able to:

1. understand the concept of WDM thoroughly.
2. gain wide knowledge of Optical Networks and applications.
3. understand the routing in optical networks.

### List of Experiments/Tutorials:

Based on syllabus topics and advanced topics in the present scenario in relation with the subject.

### Design based Problems (DP)/Open Ended Problem:

Design various optical networks for different wave lengths, different modulations and different components with the help of simulation software.

### Major Equipment:

Simulation software.

**Review Presentation (RP):** The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.