Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NECD503	Optical Networks	3	0	0	3

Course Objective

Course Philosophy:

- An optical network is a type of data communication network built with optical fiber technology. It utilizes optical fiber cables as the primary communication medium for converting data and passing data as light pulses between sender and receiver nodes. The course will give the student in-depth understanding of the functionality of optical networks and how they may be implemented. How an optical network can work together with an IP-based network infrastructure for ensuring both high reliability and performance in access, metro and transport networks, is paid special attention.
- The topics covered includes building blocks for optical networks and systems, an introduction to optical components, principles and functionality in optical network elements as well as basic physical principles and properties and constraints in optical fiber transmission. Principles and the function of optical circuit switched networks, both network elements like reconfigurable add/drops and optical cross-connects as well as the principle of a wavelength routed optical network are covered. Finally, up-to-date research in optical packet switched node and network architectures is studied.

Learning Outcomes

To get a basic understanding of physical properties of optical networks.2) To get a profound understanding of protocols applied in optical networks3) To get a profound understanding of optical switching methods and networking techniques, circuit, packet, hybrid, burst and flow.4) To get a basic understanding of optical components and optical node design.5) To be able to communicate, reason and creatively think about optical networks.6) To be able to design optical networks, taking both physical transmission properties and optical networking constraints into account.7) To be able to evaluate performance of optical packet switched nodes using discrete event simulation methods.

Module No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Evolution of optical networking - Overview of Fibre optic LANs: Suitable topologies and MAC protocols, FDDI, DQDB, Gigabit Ethernet;	7	• To understand the basic concept of optical networks • To understand the protocols applied in optical networks
2	Review of SONET/SDH and concepts of networking using IP-over-ATM-over-SONET/SDH architecture;	7	To understand the concept and working architecture of first-generation optical networks
3	WDM networks: Elements of WDM networks, Optical line terminals, Optical line amplifiers, Optical add/drop multiplexers (OADMs), Reconfigurable OADMs, Optical cross-connects.	7	To get a profound knowledge in the optical networking devices and its functions in optical networks
4	WDM backbone networks: Concepts of wavelength routing and lightpaths, Lightpath topology design, Routing and wavelength assignment, LP-based optimum design and heuristic algorithms, Wavelength conversion.	7	Ability in the establishment and management of connection request in optical networks
5	Traffic grooming in wavelength-routed backbones; IP-over-WDM and GMPLS, Protection in SONET/SDH, Protection in WDM backbone networks - dedicated and shared schemes.	7	Capable of handling traffic flow and failure/fault management in optical networks
6	Overview of Optical access networks: Hybrid fiber coax (HFC), Enhanced HFC, Fibre to the home (FTTH), Overview of Passive optical networks; Optical CDMA and Elastic Optical Network.	7	• Exposure of latest technologies in optical networks • To understand the flaws and demand in the existing optical networks and the direction for the future optical networks
	Total	**42**	

Text book: Rajiv Ramaswami, Kumar N. Sivarajan and Galen H. Sasaki, "Optical Networks: A Practical Perspective" (Third Edition) The Morgan Kaufmann Series in Networking, David Clark, Series Editor, 2010

Reference books:

1.Biswanath Mukherjee, Optical WDM Networks, Springer, 2006.

2.P.E Green, Jr. ``Fiber Optic Networks," Prentice Hall; 1 edition (July 9, 1992).

3.G. P.Agarwal, ``Fiber-Optic Communication Systems," Wiley Pubisher (2015).

4.C. Siva Ram Murthy and Mohan Gurusamy, "WDM Optical Networks - Concepts Design and Algorithms", Prentice-Hall PTR, 2002.

5.López, Víctor, Velasco, Luis (Eds.) "Elastic Optical Networks: Architectures, Technologies, and Control", Springer, 2016.