Nirma University

Institute of Technology, School of Technology

M Tech Computer Science and Engineering

Semester – II

L	T	P	C
3	0	2	4

Course Code	6CS275
Course Title	High Speed Networks

Course Learning Outcomes (CLOs):

At the end of the course, students will be able to

1. demonstrate the knowledge of network planning and optimization of high speed networks
2. apply knowledge related to the building blocks and operation of high speed networking protocols, architectures and applications
3. analyze critically and reflect on the relations and interrelations of the designed network
4. design, optimize and troubleshoot high-speed networks, optical networks

Syllabus:

Teaching Hours

Unit I **9**

High Speed Networks: Frame Relay Networks, Congestion Control in Packet Switching Networks, Frame Relay Congestion Control, Asynchronous transfer mode, ATM Protocol Architecture, Cell structure, ATM Service Categories, AAL, High Speed LAN's, Fast Ethernet, Gigabit Ethernet, Self Organizing Networks and Self-Healing Networks

Unit II **6**

Queuing Analysis: Review of Probability, Traffic Models, I/O queues at routers, Queuing Models, Single Server Queues, M/M/1 Queue, M/M/a Queue, Multi-Server Queues, Bounded buffers, Network of Queues.

Unit III **9**

TCP and Traffic Management Framework: TCP Congestion Control, Retransmission, Timer Management, Exponential RTO backoff, KARN's Algorithm, Window management, Traffic Management Frame work, Traffic Control, ABR traffic Management, ABR rate control, RM cell formats, ABR Capacity allocations, GFR traffic management.

Unit IV **7**

Quality of Service in IP Networks: Integrated and Differentiated Services, Queuing algorithms, RED, RSVP, MPLS

Unit V **6**

Optical Networks and Components: Introduction to Optical Networks, Generation of Optical Networks, SONET/SDH, Light propagation in optical fibres, Loss and bandwidth windows, System limitations, Non-Linear effects, Solitons, Optical Network Components –Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

Unit VI **8**

Optical Packet Switching and Access Networks: Photonic Packet Switching, OTDM, Multiplexing and De-multiplexing, Synchronisation, Broadcast OTDM networks, Switch-based networks, Access Networks , Network Architecture overview, Future Access Networks.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 6 experiments to be incorporated.

Suggested Readings^:

1. William Stallings, High speed networks and internet, Pearson Education
2. Harchol-Balter, Mor. Performance modelling and design of computer systems: queuing theory in action, Cambridge University Press
3. Abhijit S. Pandya, Ercan Sea, ATM Technology for Broad Band Telecommunication Networks, CRC Press, New York
4. Laurence T.Yang, Minyi Guo – High Performance Computing Paradigm and Infrastructure John Wiley
5. Rajkumar Buyya. High Performance Cluster Computing: Architectures and Systems. Prentice Hall India
6. Rajiv Ramaswami and Kumar N. Sivarajan, Optical Networks: A Practical Perspective, Harcourt Asia Pte Ltd.
7. C. Siva Ram Moorthy and Mohan Gurusamy, WDM Optical Networks: Concept, Design and Algorithms, Prentice Hall of India
8. Relevant research papers for the topics

L=Lecture, T=Tutorial, P=Practical, C=Credit

^this is not an exhaustive list