INDIAN INSTITUTE OF TECHNOLOGY ROORKEE

NAME OF DEPT./CENTRE: **Electronics and Computer Engineering**

1. Subject Code: **EC – 513N** Course Title: **Telecommunication Networks**

2. Contact Hours: **L: 3** **T: 0** **P: 0**

3. Examination Duration (Hrs.): **Theory** 0 | 3 **Practical** 0 | 0

4. Relative Weight: **CWS** 15 **PRS** 00 **MTE** 35 **ETE** 50 **PRE** 00

5. Credits: 0 | 3 6. Semester [ ] **Autumn** [√] **Spring** [ ] **Both**

7. Pre-requisite: **EC – 311 / Background of probability and random variables.**

8. Subject Area: **MSC**

9. Objective: This course is designed to provide an in - depth study of communication networks with emphasis on development of analytical tools and quantitative performance evaluation.

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	Introduction to communication networks, network topologies, internetworking, circuit and packet switching; Layered architecture and protocols, OSI reference model and functions of various layers, overview of TCP / IP, ISDN and SS – 7 protocol architectures.	3
2.	Brief characterization of communication channels and fundamental limits in digital transmission; Line codes and modems; Transmission media and transmission impairments; Synchronous and asynchronous time division multiplexing, SONET and SDH.	3
3.	Error detection: Parity check, polynomial representation, cyclic redundancy checks and their capabilities; Error control: Stop and wait, go - back n and selective repeat ARQ strategies, correctness and throughput analysis; Framing and optimum frame size; HDLC and LAPB protocols, throughput analysis of HDLC.	6
4.	Introduction to queuing models, modeling of arrivals, interarrival times and service times, Poisson process; Little's theorem, proof and examples; Continuous–time discrete event process and Markov chain, Birth-Death process; Analysis and applications of M/M/1, M/M/m, M/M/m/m, M/M/m/K and M/M/∞ queues; M/G/1 queue, vacation, reservation, polling, and priority; G/G/1 queue; Network of queues,	15

	Kleinrock's independence assumption, Burke's and Jackson's theorems.	
5.	Classification and performance measures of MAC protocols; Pure-ALOHA and slotted-ALOHA, Markov chain modeling, stability, BEB and other stabilization techniques; Splitting algorithms; Non-persistent, 1-persistent and p-persistent CSMA, performance evaluation; CSMA/CD and CSMA/CA; Polling, reservation and token ring protocols; Overview of IEEE 802 standards and frame structures of 802.3 and 802.5.	8
6.	Main issues in routing, virtual circuit and datagram routing; Classification of routing algorithms; Shortest path algorithms: Bellman-Ford, Dijkstra and Floyd-Warshall; Distributed asynchronous Bellman-Ford algorithm.	4
7.	Objectives and means of flow and congestion control, End-to-end and node by node windows, performance analysis and simplified queuing models; Rate control schemes: Time window, modeling and performance of leaky bucket algorithm.	3
	Total	**42**

11. Suggested Books:

Sl. No.	**Name of Books / Authors**	**Year of Publication**
1.	Bertsekas, D. and Gallager, R., "Data Networks", 2nd Ed., Prentice-Hall of India.	1992
2.	Kumar, A., Manjunath, D. and Kuri, J., "Communication Networking: An Analytical Approach", Morgan Kaufmann.	2004
3.	Schwartz, M., "Telecommunication Networks: Protocols, Modeling and Analysis", Pearson Education.	1987
4.	Stallings, W., "Data and Computer Communication", 8th Ed., Pearson Education.	2007
5.	Walrand, J., "Communication Networks", 2nd Ed., McGraw-Hill.	2009
6.	Kleinrock, L., "Queuing Systems: Theory", 2nd Ed., Wiley Blackwell.	2008