	Code & No:	IT 341
	Credits:	3(3,0,1)
Data Transmission & Computer Networks	Pre-requisite:	CS 240
	Co-requisite:	None
	Level:	7

Course Description:

This course introduces students to evolution trend of computer networks. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network.

Course Aims:

1. Familiar with OSI layered communication architectures.
2. Learn the fundamentals of data transmission principles: time and frequency representation of signals, relation between data rate and channel bandwidth, and transmission impairments.
3. Identify and characterize the various transmission media.
4. Identify and characterize the various data encoding techniques.
5. Understand the concepts of error detection techniques.
6. Recognize how to share a channel by using medium access control protocols.
7. Become familiar with Ethernet and IEEE standards.
8. Become familiar with wireless networks.
9. Compare between virtual circuit and datagram networks.
10. Apply and evaluate routing algorithms.

Student Outcomes (SOs):

☒(a) An ability to apply knowledge of computing and mathematics appropriate to the program's student outcomes and to the discipline

☒(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution

☒(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs

☒(d) An ability to function effectively on teams to accomplish a common goal

☐(e) An understanding of professional, ethical, legal, security and social issues and responsibilities

☒(f) An ability to communicate effectively with a range of audiences

☐(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society

☐(h) Recognition of the need for and an ability to engage in continuing professional development

☒(i) An ability to use current techniques, skills, and tools necessary for computing practice.

☐(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices. [CS]

☐(k) An ability to apply design and development principles in the construction of software systems of varying complexity. [CS]

☐(j) An ability to use and apply current technical concepts and practices in the core information technologies of human computer interaction, information management, programming, networking, and web systems and technologies. [IT]

☐(k) An ability to identify and analyze user needs and take them into account in the selection, creation, evaluation, and administration of computer-based systems. [IT]

☐(l) An ability to effectively integrate IT-based solutions into the user environment. [IT]

☐(m) An understanding of best practices and standards and their application. [IT]

☐(n) An ability to assist in the creation of an effective project plan. [IT]

Course Learning Outcomes (CLOs):

1. Understand the basis and structure of an abstract layered protocol model and transmission media.
2. Understand and apply data link (DL) layer protocols, error detection and correction approaches.
3. Understand the principles of network layer services & design principles of Internet protocols.
4. Understand the principles of delivery, forwarding, and routing techniques.

SOs and CLOs Mapping:

CLO/SO	a	b	c	d	e	f	g	h	i	j	k	l	m	n
CLO1	√	√												
CLO2	√	√	√	√		√								
CLO3			√	√		√			√					
CLO4			√	√		√			√					

No.	Topics	Weeks	Teaching hours
1	Introduction to Data Communications and Networks (network types, layering, TCP/IP & OSI models)	1	3
2	Introduction to Physical Layer (data and signals, periodic analog and digital signals, transmission impairment, data rate limits, performance)	1	3
3	Digital Transmission (line coding schemes, block coding, scrambling)	2	6
4	Transmission Media (guided & unguided media)	1	3
5	Switching (circuit & packet switching)	1	3
6	Data Link Layer (error detection & correction, error types, redundancy, block coding, cyclic codes, checksum, forward error correction)	2	6
7	Media Access Control (random access, controlled access, channelization)	2	6
8	Link layer switches, LAN standards & devices, Ethernet and IEEE standards for LANs)	1	3
9	Wireless Networks	1	3
10	Network Layer (Virtual circuit and Datagram Networks)	1	3
11	Router Structure, The Internet Protocol (IP), Routing Algorithms Broadcasting and Multicasting	1	3
	Total	**14**	**42**

Textbook:

- B. A. Forouzan, Data Communications and Networking, 5th Edition, McGraw Hill 2012.

Essential references:

- Tanenbaum, Computer Networks, 5th Edition, Prentice Hall, 2010.
- James F. Kurose, and Keith W Ross, Computer Networking: A Top-Down Approach, Addison-Wesley, 2012.

- Larry Patterson and Bruce Davis, Computer Networks: A systems Approach, Morgan Kaufmann, 2011.
- Data and Computer Communications (10th Edition) (William Stallings Books on Computer and Data Communications)Sep 23, 2013 by William Stalling, Pearson; 10 edition (September 23, 2013), ISBN-10: 0133506487, ISBN-13: 978-0133506488
- Data Communication and Networking: A Practical Approach Dec 5, 2011, by Massoud Moussavi, Cengage Learning; 1 edition (December 5, 2011), ISBN-10: 111112504X ISBN-13: 978-1111125042
- Data Communications and Networking, Behrouz A. Forouzan, McGraw-Hill Science/Engineering/Math; 5 edition (February 17, 2012), ISBN-10: 0073376221, ISBN-13: 978-0073376226