DATA COMMUNICATION AND NETWORKING	
Course Code: CI42	**Credits: 3:0:1**
Pre – requisites: Nil	**Contact Hours: 42L+14P**
Course Coordinator: Mr. Anil	

Course Contents

Unit I

Data communication Fundamentals: Introduction, components, Data Representation, Data Flow; Networks – Network criteria, Physical Structures, Network Models, Categories of networks; Protocols, Standards, Standards organization; The Internet – Brief history, Internet today; **Network Models** -Layered tasks; The OSI model – Layered architecture, Peer-to-Peer Process, Encapsulation; Layers in the OSI model; TCP/IP Protocol suite; Addressing.

- Pedagogy/Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos
- Links: https://nptel.ac.in/courses/106108098
  https://nptel.ac.in/courses/106105082
- Impartus Recording: https://a.impartus.com/ilc/#/course/96149/452

Unit II

Digital Transmission Fundamentals (with problems to solve): Analog & Digital data, Analog & Digital signals (basics); Transmission Impairment – Attenuation, Distortion and Noise; Data rate limits – Nyquist Bit Rate, Shannon Capacity; Performance, **Digital Transmission (with problems to solve):** Digital-to-Digital conversion - Line coding, Line coding schemes (unipolar, polar, bipolar)

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Unit III

Error detection & correction (with problems to solve): Introduction, Block coding, Linear Block codes, Cyclic codes – CRC, Polynomials, **Datalink control:** Framing, Flow& error control, Protocols, Noiseless channels (Simplest Protocol, Stop-and-wait protocol); Noisy channels (Stop-and-wait ARQ).

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Unit IV

Multiple Access: Random Access (CSMA, CSMA/CD, CSMA/CA), Controlled Access (Reservation, Polling, Token Passing), Channelization (FDMA, TDMA, CDMA)

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  https://nptel.ac.in/courses/106105082
- Impartus Recording: https://a.impartus.com/ilc/#/course/96149/452

Unit V

Wired LANs: IEEE standards; Standard Ethernet; **Wireless LANs:** IEEE802.11 Architecture, MAC sublayer, addressing mechanism, Bluetooth and its architecture; Connecting devices.

- Pedagogy/Course delivery tools: Chalk and talk, PowerPoint Presentation, Videos
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  https://nptel.ac.in/courses/106105082
- Impartus Recording: https://a.impartus.com/ilc/#/course/96149/452

Lab Experiments:

Students need to use OPNET Simulator to simulate the following experiments:

1. Simulate a 3-node point to point network with duplex links in between them. Set the Queue size and vary the bandwidth and find the number of packets dropped.
2. Simulate a 4-node point to point network and connect the link as follows: -
3. No-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameters and determine the no. of packets sent by TCP/UDP.
4. Simulate the different types of internet traffic such as FTP and TELNET over network and analyze the throughput.
5. Simulate the transmission of PING message over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.

6. Simulate an Ethernet LAN using N nodes (6-10), change error rate and data rate and compare Throughput.
7. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and determine collision across different nodes.
8. Simulate an Ethernet LAN using N nodes and set multiple traffic nodes and plot congestion window for different source / destination.
9. Simulate simple ESS and with transmitting nodes in WIRELESS LAN by simulation and determine the performance with respect to transmission of packets.

Suggested Learning Resources

Text Books:

1. Behrouz A. Forouzan, Data Communications and Networking, Fourth Edition, Tata McGraw-Hill, 2006.

Reference Books:

1. Alberto Leon-Garcia and Indra Widjaja, Communication Networks – Fundamental Concepts and Key architectures, Second Edition, Tata McGraw-Hill, 2004.
2. Wayne Tomasi, Introduction to Data Communications and Networking, Pearson Education, 2005.

Course Outcomes (COs):

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

1. Distinguish different communication models / protocol stacks (OSI & TCP/IP) and analyze the usage of appropriate network topology for a given scenario. (PO-1, 2, 3, PSO-1,2)
2. Handle the issues associated with digital data signals and solve the problems on data transmission by measuring the performance parameters. (PO-1, 2, 3, PSO-1, 2)
3. Apply different error detection, error correction as well as flow control strategies to solve error and flow control issues induced during data communication. (PO-1, 2, 3, PSO-2)
4. Use the different strategies of multiple access to achieve better network efficiency and analyze the network performance. (PO-1, 2, 3, PSO-1, 2)
5. Illustrate the IEEE standards for wired, wireless LANs and their connecting devices. (PO-3, 10, PSO-2)

Course Assessment and Evaluation:

Continuous Internal Evaluation (CIE): 50 Marks		
Assessment Tools	**Marks**	**Course Outcomes (COs) addressed**
Internal Test-I (CIE-I)	30	CO1, CO2
Internal Test-II CIE-II)	30	CO3, CO4, CO5
Average of the two CIE shall be taken for 30 marks		
Other Components		
Lab Test	10	CO1, CO2, CO3, CO4, CO5
Progamming Assignment	10	CO1, CO2, CO3, CO4, CO5
The Final CIE out of 50 Marks = Average of two CIE tests for 30 Marks+ Marks scored in Lab Test +Marks scored for Programming Assignment		
Semester End Examination (SEE)	100	CO1, CO2, CO3, CO4, CO5