Title of Course:	Computer Networks
Code and Credit Structure:	IT 304, 3-0-2-4
Course Placement:	Undergraduate ICT and CS Group Core
Course level:	Under graduate
Instructors:	Prof. P.S. Kalyan Sasidhar, Office: 2109, Faculty Block 2, Extn. 560 Email: kalyan_sasidhar@daiict.ac.in Prof. Sanjay Srivastava Office: 1204, Faculty Block 1, Extn. 547 Email: sanjay_srivastava@daiict.ac.in

Aims and Objectives:

The Internet is the largest engineered system that is being utilized by billions of users through their portable devices which include laptops, tablets, and smartphones. The inner workings of such a large system with many diverse components and uses needs to be understood. This includes the guiding principles and structure that can provide a foundation for understanding such an amazingly large and complex system.

This course will cover the fundamental principles of wired computer networks with focus on layered architecture, protocols, implementation and issues specific to the Internet. The objective is to provide an understanding of how the Internet works which include how data flows from a source to a destination.

The associated laboratory component is designed to expose students to the basic LAN hardware and configuration, and network simulation tools for the analysis of traffic and network protocols.

Course outcomes:

At the end of the course, students are expected to:

1. understand the TCP/IP Internet reference Model
2. learn commonly used network protocols and their design
3. be able to design and develop network applications
4. be exposed to traffic engineering and multimedia networking concepts
5. measure performance of protocols using analytical methods and simulation tools

Program outcomes

P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
X			X	X				X			

PSO 1: should be able to understand the concepts of Electronics & Communication engineering and their applications in the field of semiconductor technology, consumer electronics, embedded system, communication/ networking and other relevant areas.

Evaluation Scheme

In-Sem I	15%
In-Sem II	15%
End sem	40%
Lab	25%
Quizzes	5%

Textbook:

1. *James F. Kurose and Keith W. Ross. 2016. Computer Networking: A Top-Down Approach (7th ed.). Pearson.*

References:

1. *Douglas E. Comer. 2013. Internetworking with TCP/IP (6th ed.). Addison-Wesley Professional.*
2. *Andrew S. Tanenbaum and David J. Wetherall. 2010. Computer Networks (5th ed.). Prentice Hall Press, Upper Saddle River, NJ, USA.*
3. *Larry L. Peterson and Bruce S. Davie. 2011. Computer Networks, Fifth Edition: A Systems Approach (5th ed.). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA.*

Course Conduct and Grading Policy

1. Students are supposed to be present for all lectures and lab sessions.
2. If the attendance falls below 70%, a student will receive an F grade. (An institute-wide detailed policy will be communicated separately and will supersede this, once that takes effect)
3. **All lab assignments must be completed**, failing which zero marks will be awarded for the lab component. One makeup lab session will be scheduled at the end of the semester for students who miss a session due to any reason. For special medical cases, if the Dean, AP has approved their application, additional makeup sessions may be provided to the concerned students.
4. If a case of plagiarism/copying is detected in the exams or lab submissions, then that student will **receive zero marks** in the **complete lab segment (25%)** or the respective **exam component**. The student will also be reported to the Dean AP for possible further actions.

Lecture Outline:

Sl No	Description		Lectures
1	Overview		6
	1.1	Overview	
	1.2	Internet-Birds' Eye View, History	
	1.3	Internet-Layered Architecture:OSI and TCP/IP architectures	
	1.4	Packet Switching, Best Effort Services	
2	Network Applications		6
	2.1	Client-Server Applications	
	2.2	Chat Application Design, Socket Programming	
	2.3	SFTP File Transfer Protocol	
	2.4	Domain Name Service, Mail, SMTP	
	2.5	Peer to Peer Search, Distributed Hash	
	2.6	Video Streaming, DASH	
3	End to End Issues		6
	3.1	Transport Layer Basics	
	3.2	Reliability	
	3.3	Connectionless and Connection Oriented Transport	
	3.4	TCP and UDP protocols	
	3.5	Congestion Management	
	3.6	TCP Performance Measure	
4	Routing and Congestion		6
	4.1	Introduction	
	4.2	Scheduling, Best Effort Service	
	4.3	Scheduling for Guaranteed Service, Switching	
	4.4	Packet Switching, Batcher Banyan Switch	
	4.5	Routing - Introduction, Multicast, Broadcast	
	4.6	Addressing, CIDR, IP Protocol IPv4, IPv6	
	4.7	Hierarchical Routing, BGP, Mobile Routing	
	4.8	Control and Data Path, Open Flow	
	4.9	Software Defined Networking	
5	Link Layer Technologies		6
	5.1	Introduction	
	5.2	Media Access Protocols, ALOHA	
	5.3	IEEE 802.3 Ethernet Protocol, MACA	
	5.4	Switched LAN, Virtual LANs	

Sl No	Description		Lectures
6	Wireless Networks		4
	6.1	Introduction	
	6.2	IEEE 802.11 MAC protocol	
	6.3	Cellular architecture and Mobility management	
Optional Topics			
7	Content Distribution Networks		2
	7.1	Architecture and protocols	
	7.2	Video Streaming, DASH	
8	Data Center Networks		2

Lab Outline:

A. LAN hardware, Configuration, Network Services
   1. Making LAN cable and setting up a LAN
   2. Multi-LAN communication using a Router. Configuring DHCP, and DNS

B. Network Simulation on NETSIM
   https://www.tetcos.com/documentation/NetSim/v13/NetSim-Experiments-Manual/index.htm
   1. Network Performance Measures, Delay, Throughput, Bottleneck Analysis
   2. TCP connection management
   3. TCP performance as a function of error rate, and Round trip time
   4. Wireless Lan with AP and WiFi Performance studies

C. Protocol Study and Analysis using Wireshark and Trace files
   https://gaia.cs.umass.edu/kurose_ross/wireshark.php
   1. TCP and UDP
   2. DHCP and NAT

D. Socket Programming
   1. Basic Stream and datagram socket applications
   2. Multi-threaded clients and Server performance as a function of load