K. J. Somaiya School of Engineering, Mumbai
Somaiya Vidyavihar University

# Computer Networks

**(216U01C502 and 216U01L502)**

# Introduction to Course

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# Course Objectives

1. To introduce concepts and fundamentals of data communication and computer networks.
2. To explore the inter-working of various layers of OSI model.
3. To understand and apply IP addressing concepts in network design.
4. To assess the strengths and weaknesses of various routing algorithms
5. To understand the transport layer and various application layer protocols

# Course Outcomes

| Course Outcome | After successful completion of the course students should be able to |
|---|---|
| CO1 | Explain the fundamentals of data communication networks, reference models, topologies, physical media, devices, simulators and identify their use in day to day networks |
| CO2 | Demonstrate Data Link Layer, MAC layer technologies & protocols and implement the functionalities like error control, flow control |
| CO3 | Demonstrate various network layer protocols and network design using IP addressing, forwarding, routing concepts. |
| CO4 | Demonstrate Transport layer concepts like socket, flow control, error control, congestion control, QoS. |
| CO5 | Describe various features and operations of Application layer protocols such as Telnet, HTTP, DNS, SMTP |

# Modes of Content Delivery

- Classroom Teaching - Learning
- Visual Aids/ Video Lectures
- Guest Lecture

- Quiz
- Open Book Test
- Assignments
- Seminar

# Modes of Conduction

- Resource Sharing
  - Moodle LMS
- Lab Related work and submissions
  - Moodle LMS
- Quizzes / Assignments
  - Moodle LMS/ Google Classroom

# Credit and Examination Scheme

# Evaluation Scheme

- Number of credits – 04 (TH – 03 , PR – 01)
- In semester Exam– 30 marks
- Internal Assessment – 20 marks (Two IA components)
- End Sem Exam – 50 marks

- Lab CA- 50 marks
- Lab Experiment performance, Oral / Viva / OST

# IA 1 and 2

- Class Quizzes - LMS/ Google Classroom/form
  - During lectures

- Quiz / Open book Test /assignment

# Syllabus and Experiment List

# List of Books


1. *Behrouz A Fourouzan*, “Data Communications & Networking”, 4th edition, *McGraw-Hill*
2. *Behrouz A Fourouzan*, “TCP/IP Protocol Suite”, 4th edition, *McGraw-Hill*
3. *Andrews Tannenbaum*, “Computer Networks”, 3rd Edition, *PHI*


*Important Weblink*

http://highered.mheducation.com/sites/0072967757/information_center_view0/index.html

# Lets Discuss..

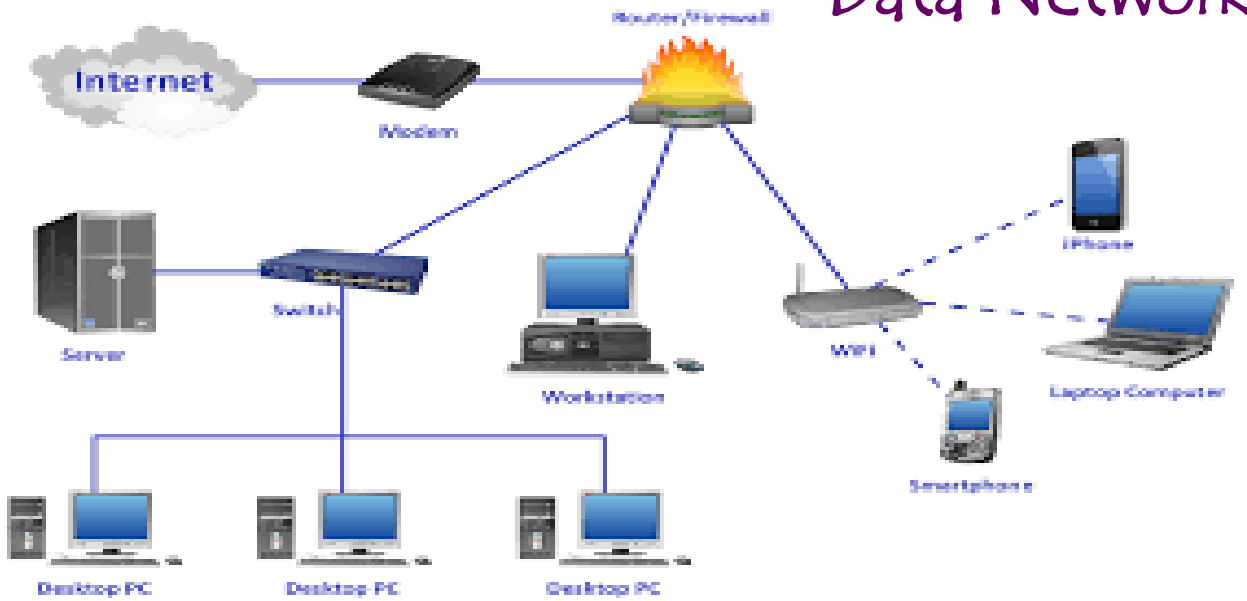
# Internet

- Communication network for information exchange; makes various services available irrespective of physical location
- Services provided
  - Communication– Email, Chat, Voice/Video conferencing (WhatsApp, …)
  - Business/Commerce- Online Banking, online shopping (Flipkart, Amazon..), flight/railway reservations, e-wallets…
  - Infotainment- Videos (YouTube, Netflix, loco…), Social Networks (Facebook, Twitter, Instagram..)
  - Education- Wikis, Online courses- MOOCs (Coursera, NPTEL), webinars, Online Classroom, online Labs (Colab etc)…
  - Governance ….
- Wireless Network: Networking on the move
  - Freedom from wires: Anytime Anywhere Communication

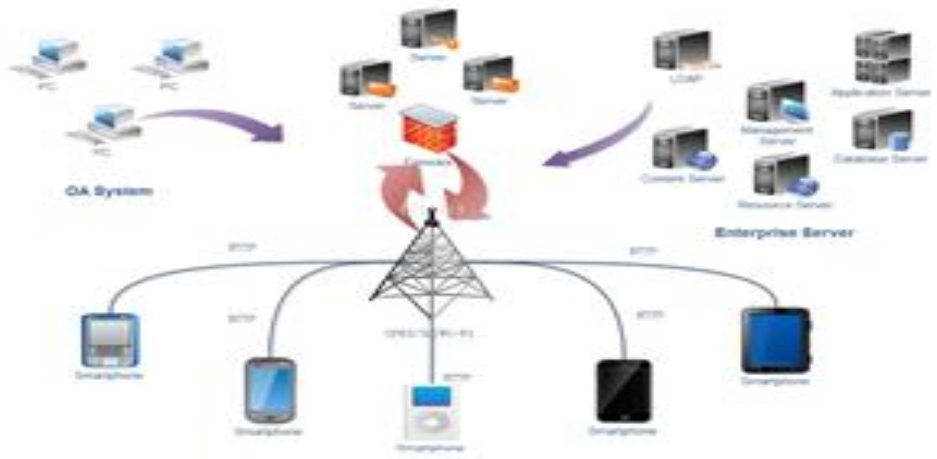
# Motivation

- Why should I study CN?
  - Reasons other than Compulsory course
- Pandemic scenario
  - Imagine what would have been the scenario if the COVID-19 pandemic had hit in the 80's..
- World full of Networks…
  - Networks in day to day life
    - Can I have quick response from you?

# Data Networks








# Trending techs

- Cloud Computing
  - Make data, software programs and computing infrastructure available as a service
- Internet of Things
  - Connect smart objects to Internet (Home automation, Intelligent transport, Healthcare, e-agriculture, Smart grid, Smart cities etc…)
- Data Analytics and AI-ML, DL, GenAI…
- SMAC

- → Computer/ Data Network acts as an enabling technology

# Impact/ Statistics

- As of August 2022
- 5.4B (billion) Internet users (> 60% of population);
  - – India > 40% of population
- 13,116,950,308 GB (peta bytes)of Internet traffic
- Approx 2B websites
- 3M emails sent in 1 sec (67% spam)
- >2B Facebook users
- Approx 1 Lakh videos watched per sec on YouTube
- > 1 Lakh Google searches in 1 sec
- Ref: http://www.internetlivestats.com/

# How it matters to me?

- High dependency and demand
  - Exciting Area: Plenty of scope for innovation
    - Domains: Cloud, BDA, SMAC, IoT…
  - Job Market: Plenty of job opportunities
  - Basic Knowledge: Helps understand/debug networks
    - Useful in web and mobile Application development
    - Also to fix day to day issues related to home internet; appreciation from friends/family

# Course Goals

1. Understand the basics of wired communication and appreciate the challenges posed
2. Understand how some of the challenges are overcome at the different layers of the protocol stack
3. In the process, explore/familiarize with a few popular standards/protocols (e.g. Ethernet, WiFi, IPv4/v6, TCP, HTTP…)
4. Implement/experiment some of the ideas (in the form of lab expts)

- Source: CS 224 Computer Networks course, IIT -Bombay

# Summary

- Information age
- High dependence on computer networks
  - Personal or business front
  - has seen tremendous growth and growth expected to continue (4G, 5G, 6G…)
  - → Important to understand how it works

# Module 1: Introduction to Networking

1.1 Types of Networks: LAN, WAN, MAN. Network Topology (types)

1.2 Network Software: Protocol hierarchy, Design Issues for layers, Connection oriented and connectionless services, Reliable and Un-reliable services

1.3 OSI and TCP/IP reference model, Comparison of OSI and TCP/IP reference model

1.4 Overview of connecting devices, NIC, Repeater, Hub, Bridge, Router, Gateway

1. Self learning: Guided and unguided transmission

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# Cisco Packet Tracer

- Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks.
- Allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface
- GUI- drag and drop user interface, allows users to add and remove simulated network devices
- Educational tool for helping students learn fundamental CCNA concepts; Free of charge for educational use for registered users
- https://www.netacad.com/portal/resources/packet-tracer

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