Computer Networks

Course Overview

This intermediate course is for students with a foundational understanding of IT concepts, designed to enhance their knowledge in computer networking. Through theoretical lessons, practical labs, and project work, participants will delve into network design, protocols, and troubleshooting techniques. The course aims to equip students with the skills necessary to analyze, configure, and manage computer networks effectively, using industry-standard tools and technologies.

Course Objectives

- Understand the fundamental concepts of computer networks, including the OSI model, network topologies, and key protocols.
- Learn to use network analysis tools such as Wireshark for capturing and analyzing network traffic.
- Learn network protocols and architectures, including TCP/IP, UDP, HTTP, and DNS.
- Explore IP addressing, subnetting, and routing algorithms to design and implement efficient networks.
- Develop skills in network security, learning to implement encryption, VPNs, and firewalls to protect network data.
- Explore advanced networking concepts such as wireless communication, Software-Defined Networking (SDN), and Network Functions Virtualization (NFV).

Unit 1: Introduction to Computer Networks

Introduce the fundamentals of computer networking, including the structure and function of the internet, network protocols, and performance issues.

- ☐ Overview of Computer Networks
- ☐ OSI Model
- ☐ End Systems, Clients, and Servers
- ☐ Switching and Routing
- ☐ Capturing and Analyzing Network Packets (Intro to Wireshark)
- ☐ Throughput, Delay, and Packet Loss
- ☐ **Unit 1 Test**

Unit 2: Network Protocols and Architectures

Dive into the details of network protocols and architectures, focusing on how data is transported across the internet.

- ☐ Transport Layer Protocols: TCP and UDP
- ☐ The Application Layer: HTTP, DNS, SMTP, and FTP
- ☐ Network Security Fundamentals: Encryption, VPNs, and Firewalls
- ☐ IP Addressing and Subnetting
- ☐ Routing Algorithms: Shortest Path, Flooding, Distance Vector, Link State
- ☐ IPv4 vs. IPv6: Differences and Transition Mechanisms
- ☐ Hands-on Exercise: Set up and configure a simple network
- ☐ **Unit 2 Test**

Unit 3: Advanced Networking Concepts

Explore advanced networking topics, focusing on network management, performance optimization, and emerging technologies.

- ☐ Wireless Networks and Protocols: WLAN, 802.11, and Mobile Networks
- ☐ SDN and NFV
- ☐ Network Troubleshooting and Tools
- ☐ Quality of Service (QoS) and Performance Tuning
- ☐ Emerging Network Technologies and Trends: IoT, Cloud Networking
- ☐ **Unit 3 Test**