Welcome to

IT CENTER SCHOOL OF TECHNOLOGY

Computer Networking Course

Milestone July - Dec 2024

COURSE OBJECTIVES

The objective of the Computer Networking Course is to provide a comprehensive understanding of networking principles, technologies, and practices. Students will learn key concepts such as network topologies, protocols, IP addressing, subnetting, network security, and device configuration. The course includes hands-on labs and projects to reinforce learning, ensuring students gain practical skills in configuring and managing network devices, securing network infrastructure, and troubleshooting network issues. By the end of the course, students will be proficient in using tools like Packet Tracer, understand the importance of network standards, and be prepared to design, implement, and manage robust network solutions.

CAREER OBJECTIVES

The career objective of the Computer Networking Course is to equip students with the essential skills and knowledge required to excel in the field of networking. Upon completion, students will be prepared for roles such as Network Administrator, Network Engineer, Network Security Specialist, IT Support Specialist, or Network Consultant. The comprehensive curriculum ensures that students can confidently utilize key networking technologies and tools, implement secure and efficient network solutions, and understand the full lifecycle of network management. This foundation will enable them to pursue career opportunities in various industries, contribute to innovative projects, and adapt to the evolving demands of the tech industry

TOOLS REQUIRED

For student to complete and participate in this course, the following tool are required:

1. Must have Laptop/Desktop Computer
2. Must have Wi-Fi / Data
3. Packet Tracer Software Installed (You will be guided)
4. Ability to use Google Meet

RESOURSE/MATERIALS AND ASSESSESSMENTS

1. Learning materials (Notes or Video provided)
2. Assignments, Assessment and Projects

WEEKLY COURSE OUTLINE

WEEK 1

Introduction to Computer Networking

- Brief description of computer networking and how it affects the way people interact in their day to day work activities
- Difference between internet and computer networking
- Importance of computer networking and its disadvantages
- Main Components of a computer network
- Overview of computer network architecture
- Descripting of network topology and different types of network topologies (bus, ring, star, mesh, point-to-point, hybrid, tree)
- Difference between PAN, LAN, WAN, CAN, MAN, VPN)

WEEK 2

Network Media and devices

- Understand cabling in computer networking
- Different cabling standards with their speed, advantages and limitations (CAT3 CAT5, CAT5e, CAT6, CAT6e, CAT7)
- Properties of the cables
- Different types of cable (Ethernet, copper, fiber o
- Common connector types
- Different network devices (Host, switch, router, hub)

WEEK 3

Wiring standards

- Understanding Wiring Standards
- Understanding of Organizations Defining Wiring Standards (TIA/EIA, ISO/IEC, IEEE)
- Understanding of Key Components of TIA/EIA-568 Standards
- Understanding of TIA/EIA-568 Cabling Categories
- Understanding of Ethernet Wiring Standards (IEEE 802.3 Standards)
- Understanding of Fiber Optic Wiring Standards and different fiber optic cable types (Singlemode Fiber, Multimode Fiber)
- Understanding of Fiber Optic Connectors
- Understanding of Cable Installation Best Practices

WEEK 4

Network Protocols and Communication

- Understanding of network protocols and Communication
- Different network protocols
- Rules of Communication
- Understanding of encapsulation and de- encapsulation
- Understanding of Open Standards (IEEE, IANA, IETF, TIA, ITU, ICANN)
- Understanding of internet standards (ISOC, IAB, IETF, IRTF, ICANN, IANA)
- Electronics and Communications Standard Organizations (IEEE, EIA, TIA, ITU-T)
- Understanding of protocol suite
- Difference between OSI model and TCP/IP model
  - Other network protocols (
- The Benefits of Using a Layered Model

WEEK 5

Routing protocols

- Define routing protocols
- Difference between static and dynamic routing
- Understanding of distance-vector routing Protocol
- Understanding of Link-state routing Protocol
- Understanding of IPv4/IPv6 Routing protocols

WEEK 6

IP addressing

- Define IP Addressing
- Understanding of IPv4 Addressing
  - Structure of IPv4 Addresses
  - Classes of IPv4 Addresses (Class A, B, C, D, E)
  - Private vs Public IPv4 Addresses
  - Subnetting and CIDR (Classless Inter-Domain Routing)
- Understanding of IPv6 Addressing
  - Structure of IPv6 Addresses
  - Types of IPv6 Addresses (Unicast, Multicast, Anycast)
  - IPv6 Address Notation and Prefixes

WEEK 7

IP addressing Cont …

- Understanding of IP Address Allocation
  - Static vs Dynamic IP Addresses
  - DHCP (Dynamic Host Configuration Protocol)
- Understanding of Special IP Addresses
- Understanding of Address Resolution Protocol (ARP)
- Understanding of NAT (Network Address Translation)
  - Purpose of NAT
  - Types of NAT (Static, Dynamic, PAT)
  - NAT Configuration and Operation

WEEK 8

Wireless technology

- Define wireless technology
- Characteristics of wireless communication standards
- Types of Wireless Networks (WPAN, WLAN, WMAN, WWAN)
- Understanding of Wireless Standards (IEEE 802.11, Bluetooth, Zigbee)
- Understanding of Wi-Fi Technology
  - Wi-Fi Frequency Bands (2.4 GHz, 5 GHz, 6 GHz)
  - Wi-Fi Channels and Channel Bonding
  - Wi-Fi Security Protocols (WEP, WPA, WPA2, WPA3)
- Understanding of Wireless Devices and Components
  - Access Points (APs)
  - Wireless Controllers
  - Wireless Network Interface Cards (NICs)

WEEK 9

Wireless technology cont …

- Understanding of Antenna Types and Technologies (Omnidirectional, Directional, MIMO)
- Understanding of Wireless Network Design (Site Surveys, Coverage Planning, Capacity Planning)
- Understanding of Wireless Security
  - Encryption Methods
  - Authentication Protocols
  - Wireless Intrusion Detection Systems (WIDS)
- Understanding of Emerging Wireless Technologies
  - Wi-Fi 6 and Wi-Fi 6E
  - 5G Networks
- Understanding of Challenges and Solutions in Wireless Networks
  - Interference and Mitigation
  - Signal Propagation Issues

WEEK 10

Network Security

- Introduction to Network Security
- Difference between Cybersecurity VS Information security
- Fundamentals of Network Security (Confidentiality, Integrity, Availability)
- Different types of hackers and their motivations (Black hats, Grey Hats, White hats)
- Types of Network Security Threats
  - Malware (Viruses, Worms, Trojans)
  - Phishing and Social Engineering
  - Denial of Service (DoS) and Distributed Denial of Service (DDoS) Attacks
  - Man-in-the-Middle (MitM) Attacks
  - SQL Injection and Code Injection Attacks
- Understanding of Network Security Protocols (IPSec, SSL/TLS, SSH, HTTPS)

WEEK 11

Network Security …

- Understanding of Firewall Technologies (Packet Filtering Firewalls, Stateful Inspection Firewalls, Proxy Firewalls)
- Understanding of Intrusion Detection and Prevention Systems (IDS/IPS)
  - Network-based IDS/IPS
  - Host-based IDS/IPS
- Understanding of Virtual Private Networks (VPNs)
  - Site-to-Site VPN
  - Remote Access VPN
  - VPN Protocols (PPTP, L2TP, OpenVPN, IKEv2)
- Understanding of Authentication, Authorization, and Accounting (AAA)
  - RADIUS (Remote Authentication Dial-In User Service)
  - TACACS+ (Terminal Access Controller Access-Control System Plus)
  - Multi-Factor Authentication (MFA)
- Understanding of Endpoint Security (Antivirus and Anti-Malware Software)
- Understanding of Security Information and Event Management (SIEM)
  - Log Management
  - Incident Response
  - Compliance Reporting
- Understand of Security Best Practices
  - Regular Security Audits and Assessments
  - User Training and Awareness
  - Data Encryption
  - Backup and Disaster Recovery Planning
- Understanding of Emerging Network Security Technologies
  - Zero Trust Architecture
  - Artificial Intelligence and Machine Learning in Security
  - Blockchain for Security

WEEK 12

Network Device Configuration

- Introduction to Packet tracer and its installation
  - User Interface Overview
  - Basic Network Topology Creation (Adding Devices, Connecting Devices)
- Configuring Network Devices
  - Basic Router Configuration (Accessing the CLI, Setting Hostnames, Configuring Interfaces, …)
  - Basic Switch Configuration (Accessing the CLI, Setting Hostnames, Configuring VLANs, …)
  - Configuring End Devices (PC Configuration, Setting IP addresses, subnet masks, and default gateways, Testing Connectivity)
- Troubleshooting and Simulation
  - Common Troubleshooting commands (Ping, Traceroute, Show Commands, …)

Week 13

Subnetting

- Introduction to Subnetting
- Benefits of Subnetting
- Understanding of IP Addressing and Subnet Masks
  - Understanding of IP Address Structure (IPv4 Addressing, IPv6 Addressing)
  - Understanding of Subnet Masks (Definition, Default Subnet Masks, Custom Subnet Masks)
- Understanding of Subnetting Techniques
  - Calculating Subnets
  - Subnetting a Network (Step-by-Step Process)
  - Introduction to Subnetting with CIDR
- Practical Subnetting Examples
  - Subnetting Class A Network
  - Subnetting Class B Network
  - Subnetting Class C Network
  - Subnetting IPv6
- VLSM (Variable Length Subnet Masking)
  - Definition and Benefits
  - Implementation: Step-by-step process for implementing VLSM

Week 14

Computer Networking Practicals

- Revision week
- More projects

Week 15

FINAL PROJECT

GOOD LUCK!!!