Suggested Teaching Guideline for
Fundamentals of Computer NetworksPG-DITISS September 2022

Duration: 80 classroom hrs (40hrs theory + 40 lab hrs)

Objective: To introduce the student to fundamentals of computers and networks
Evaluation method: Theory exam – 40% weightage
Lab exam – 40% weightage
Internal Assessment– 20% weightage

List of Books / Other training material

Courseware: Data Communications and Networking, Behrouz A. Forouzan, McGraw Hill Education; Fifth edition

Session 1:
- Internetworking
- OSI model

Assignment:
1) Difference between UTP & STP
2) Write categories of cables
3) What is e in CAT5e?
4) What is OSI Model?

Session 2:
- Ethernet
- Wireless Networking

Session 3:
- Internet Protocol
- TCP/IP model

Assignment:
1) What is IP?
2) What is TCP/IP Model?
3) Write a difference between TCP & UDP.

Session 4 & 5:
- IP Subnetting & variable Length Subnet Masking

Assignment:
1) What is Subnetting?
2) Determine the network and host part of 192.168.5.85 /24 , 10.128.240.50/30 address.
3) Divide the network as per following requirement 192.168.1.0/24
   a. Subnet 1 =28 hosts
   b. Subnet 2 =52 hosts
   c. Subnet 3 =15 hosts
   d. Subnet4 = 5 hosts

Session 6:
- Router IOS & Security Device Manager

Assignment:
1) Subnet the Class C IP Address 195.1.1.0 So that you have 10 subnets each with a maximum 12 hosts on each subnet. List the Address on host 1 on subnet 0,1,2,3,10.
2) Divide the network to find 500 hosts in each subnet.
   152.152.0.0 /16

Session 7:
- Managing an Internetworking Router

Lab Assignments:
Working with Router Booting, configuration registers, Router IOS, Telnet, Resolving Hostname, Debugging.

Session 8:
- Static Routing
- Dynamic Routing
- Routing Protocols

Session 9 & 10:
- Implementing of Routing Protocols

Lab Assignments:
Implementation of Static Routing, RIP, IGRP, EIGRP, OSPF

Session 11:
- Layer 2 switching

Theory Assignment:
1) What is Spanning Tree Protocol (STP)?
2) Write types of Spanning Tree Protocol (STP).
3) How to change a priority number of Spanning Tree Protocol (STP)?
4) How to disable Spanning Tree Protocol (STP)?

Lab Assignments:

1. Configuration of switch, STP
2. Create the following topology for STP and configure a specific switch as root bridge by changing priority number.

Session 12:
- Virtual LANs

Lab Assignments:
1. Configure, verify, and troubleshoot VLANs (normal/extended range) spanning multipleswitches, inter-VLAN routing
2. Create following topology where Switch 1 is Server mode and switch 2,3,4,5 are client mode. Use network 192.168.10.0 /24
   - Transfer the Vlan info from server to all clients.

- Assign vlan as mention in the topology.
- PC's in having same vlan should ping each other.

3. Create following topology where Switch 1 is Server mode and switch 2,4, are client mode.
   Use network 192.168.1.0 /24
   - Transfer the Vlan info from server to all clients.
   - Assign vlan as mention in the topology.
   - PC's in having same vlan should ping each other.
   - Configured switch 3 in transfer mode and transfer vlan info to switch 4

Session 13:
- Infrastructure Security

Lab Assignments:
- Configure, verify, and troubleshoot port security, describe common access layer threat mitigation, Configure, verify, and troubleshoot IPv4 and IPv6 access list for traffic filtering techniques,
- Verify ACLs using the APIC-EM Path Trace ACL analysis tool
- Configure, verify, and troubleshoot basic device hardening
- Describe device security using AAA with TACACS+ and RADIUS

Session 14:
- NAT
- IPV6
- WAN Technologies

Lab Assignments
NAT configuration, Configuring Routers with IPv6

Session: 15

Lab Assignments:
- Configure and verify PPP and MLPPP on WAN interfaces using local authentication
- Configure, verify, and troubleshoot PPPoE client-side interfaces using local authentication, Configure, verify, and troubleshoot GRE tunnel connectivity.
- Configure and verify single-homed branch connectivity using eBGP IPv4 (limited to peering and route advertisement using Network command only)

Session 16:
- Introduction to SDN,
- Overview and Architecture of SDN

- Scalability (Data Centres, Service provider networks, ISP Automation)
- Reliability (QoS, and Service Availability)
- Consistency (Configuration management, and Access Control Violations)
- Opportunities and Challenges

Session 17:
- Virtual networking
- Use-cases (Network Access Control, Virtual Customer Edge, Datacenter Optimization)

Session 18:
- Introduction to OpenFlow
- History and evolution
- Control and data plane separation
- OpenDaylight architecture overview

Lab Assignment:
- Understanding the classroom environment
- Installing OpenDaylight
- Initial Configuration
- Initial Controller Interations

Session 19:
Getting Started with Opendaylight
- How to get started
- OpenDaylight clustering
- Model-Driven Service Abstraction Layer
- Internal datastore
- OpenFlow plugin
- OpenVSwitch concepts
- Mininet overview
- L2Switch Application

Lab Assignment:
   Configuring an OpenDaylight Cluster
- Initial Command Line Interactions
- Enabling Required Features
- Launching the User Interface
- Creating an Emulated SDN Network
- Running L2Switch

Session 20:
Getting more from Opendaylight
- OpenDaylight and AAA
- Introduction to OVSDB Virtualization
- Application Intents and Group Based Policy
- Service Function Chaining
- LISP Flow Mapping
- Virtual Tenant Networks

Lab Assignment:

- Advanced AAA integrations
- Creating Virtual Networks
- Working with policies and intents
- Initial Service Function Chaining
- OpenDaylight and OpenVSwitch