Suggested Teaching Guideline For

Concept of Operating Systems & Administration PG-DITISS September 2022

Duration: 90 Classroom hrs + 90 Lab hrs (Total: 180 Hrs)

Objective: To introduce the student to concepts of Operating Systems & Administration.

Evaluation method: Theory exam – 40% weightage
Lab exam – 40% weightage
Internal Assessment – 20% weightage

List of Books / Other training material

Courseware: Linux Administration: A Beginner's Guide by Steve Shah, Wale Soyinka/TMH

Reference book:

- Mastering Windows Server 2012 R2 by Brian Svidergol, Vladimir Meloski
- Windows Server 2016 Administration Fundamentals by Bekim Dauti

Note: Encourage candidates to implement lab using scripts.
Concept of OS (16 Hrs) (8 Hrs Theory + 8 hrs Lab):

Session 1: Architecture of Operating Systems

- Introduction to operating systems and terminologies
- A typical monolithic-architecture of operating systems
- Kernel Components and Non-kernel Components
- User-space vs Kernel-space & User-mode vs Kernel- mode
- Interrupt Management
- H/W Interrupts/ handler
- hardening of the OS

Session 2 & 3: Process Management

- H/W Clocks and Timers vs S/W Clocks and Timers
- Process management
- Process Scheduling
- CPU Scheduling
- Preemptive vs non-Preemptive
- Different types of Scheduling policies
- Algorithm-FCFS, RR, PRIO, FAIR-SHARE, EDF

Session 4: Memory & File System Management

- Virtual Memory Techniques
- Page Replacement Algorithm
- H/W Technologies available for memory management
- Segmentation/ Paging
- File System Organization
- Physical File System Organization Techniques FAT/NTFS file system manager in the kernel
- Disk-cache Management

Windows Operating System and Security Issue (64 Hrs - 32 Hrs Theory + 32 hrs Lab)

Session 1:

- Overview of windows operating system
- Installation of windows operating system

Lab:

- Install, upgrade, and migrate servers and workloads
- Create, manage, and maintain images for deployment

Session 2: Hyper-V & Storage Solutions

- Implement Hyper-V
- Configure disks and volumes
- Implement server storage
- Implement data deduplication

Lab:

- Install and configure Hyper-V
- Configure virtual machine (VM) setting

Session 3:

- Implementation, planning and maintaining of active directory infrastructure

Lab:

- Implementing and administering Active Directory
- User accounts and groups in an Active Directory Domain
- Implementing an Active Directory Domain Services (ADDS)
    - Domain Controller (DC)
    - Additional Domain Controller (ADC)
    - Client (Windows 7/10)
    - Member Server (MS)

Session 4:

- Configuring DNS
- Implement DHCP and IPAM

Lab:

- Configuration of DNS server
- Install and configure DHCP
- Manage and maintain DHCP
- Implement and Maintain IP Address Management (IPAM)

Session 5:

- Implement Network Connectivity and Remote Access Solutions

Lab:

- Implement network connectivity solutions
- Implement virtual private network (VPN) and Direct Access solutions

Session 6 & 7:

- Concept of Network Policy Server (NPS), Local policies and Group Policies

Lab:

- Implement Network Policy Server (NPS)
- Implement Local policies & Group policies

Session 8:

- Concept of Core and Distributed Network Solutions
- Concept of Flexible Single Master Operation (FSMO)

Lab:

- Implement IPv4 and IPv6 addressing
- Implement Distributed File System (DFS) and Branch Office solutions
- Implement Flexible Single Master Operation (FSMO)

Session 9 & 10:

- Concept of File Server Resource Manager (FSRM)
- Concept of Windows Server Backup (WSB)

Lab:

- Implement File Server Resource Manager (FSRM)
- Implement Windows Server Backup (WSB)

Session 11:

- Concept of Windows Deployment Service (WDS)

Lab:

- Deploying Windows 7/10 using WDS

Session 12:

- Concept of IIS Web Server

Lab:

- Implement of IIS Web Server

Session 13:

- Concept of Exchange server

Lab:

- Installing and implementing of Exchange Server.

Session 14:

- Concept of Network Load Balancing (NLB)
- Troubleshooting

Lab:

- Implement of Network Load Balancing (NLB)
- Maintenance and troubleshooting
- Introduction to Microsoft Windows 7 & 10 security
- Security issues at the Active Directory level
- Evaluating and analyzing workstation security
- Securing Windows services

Session 15 & 16:

- Power Shell

Lab:

- Windows Power Shell Technology Background and Overview
- Power shell Error Handling and Debugging
- Windows Administration using power shell
- Background Jobs and Remote Administration
- Windows Power Shell Tips & Re-Using Scripts and Functions

Linux Operating System and Security (100Hrs) (50 Hrs Theory + 50 hrs Lab)

Session 1 & 2:

- Introduction to Linux
- The Linux File System
- Working with Files and Directories
- Getting Started to Linux
- Revision of basic Commands
- Access control list and chmod command
- chown and commands
- Network Commands like telnet, ftp, ssh, and sftp,finger
- Use of secondary storage devices (Like: - Hard disk, Floppy, CDROM) in Linux environment and formatting of these devices.

Lab:

- Getting Acquainted with the Linux Environment
- Use various commands in Linux system.

(ls, cp, mv, lpr, sort, grep, cat, tac, more, head, tail, man, whatis, whereis, locate, find, diff, file, rm, mkdir, rmdir, cd, pwd, ln and ln –s, gzip and gunzip, zip and unzip, tar and its variants, zcat, cal, bc and bc –l, banner date, time, wc, touch, echo, who, finger, w, whoami, who am i, alias, unalias, touch, push, pop, jobs, ps, etc.)

Session 3 & 4:

- Installation of Linux
- The interactive Anaconda installer
- A hands-free method of installation
- Understanding the boot procedure
- Configuring the GRUB boot loader
- The Initial RAM Disk
- Understanding run levels
- Repository & Package Management (RPM & DEB)

Lab:

Installation of Linux, configuring Boot Loader, Yellow dog updater configuration

Session 5:

- Shutdown and Installation concepts
- Kick Start Configuration & Customization
- Deployment using Kickstart
- User administration

Lab:

- Installation of basic packages, configuring Kickstart, User Administration

Session 6:

- Network address Ipv4/Ipv6
- Using OpenSSH for network communications
- Using VNC for network communication
- Network Authentication

Lab:

- Configuring Network address, OpenSSH, VNC

Session 7:

- User & Group Management

Lab:

- User & Group Management

Session 8:

- Disk management

Lab:

- Fdisk, gdisk, LVM

Session 9:

- Network Implementation & print services

Lab:

- Network Implementation & print services

Session 10:

- Services Management
- System Configuration Files

Lab:

- Working with System configuration files, NIS Configuration

Session 11:

- Patches
- System Management
- X configuration server

Lab:

- Working with patch management, X configuration

Session 12:

- Configuration of DNS

Lab:

- Configuration of DNS

Session 13:

Introduction to Configuring Services

- Setting up an NFS server
- Setting up an FTP server

Lab:

Configuring NFS

Session 14:

- The Samba Server: networking with Windows system
- Configuring a DHCP server
- Configuring a DNS server

Lab:

Configuring Samba, DHCP Server, DNS Server

Session 15:

- Configuring the Apache web server
- Apache security & Virtual Hosting
- Configuring the Squid web proxy cache

Lab:

Configuring Apache Web Server, Virtual hosting, Squid Proxy

Session 16:

- Understanding e-mail delivery
- Postfix Mail Server
- Dovecot: an IMAP and POP server
- squirrel Mail Web Client

Lab:

Configuring Postfix, Dovecot, Squirrel Mail

Session 17:

- Introduction to Performance Tuning
- Maintenance and troubleshooting
- The Threat Model and Protection Methods

Session 18:

- Basic Service Security
- Logging and NTP
- BIND and DNS Security

Session 19:

- Network Authentication: LDAP & NIS
- Apache Clustering
- Load Balancer

Lab:

- Configure and implement of LDAP.
- Configure and implement of NIS.

Session 20:

- Virtual Machine management
- Virtual machine Network Configuration

Session 21 & 22:

- Introduction to BASH Command Line Interface (CLI) Error Handling
- Debugging & Redirection of scripts
- Control Structure, Loop
- Variable & String
- Conditional Statement Regular Expressions

Lab:

- Working to automate bash commands using bash scripts.
- Bash script using loops, Strings, regular expressions

Session 23:

- Automate Task Using Bash Script
- Security patches

Lab:

- Working to automate bash commands using bash scripts.

Session 24:

- Logging & Monitoring using script

Lab:

- Working to automate bash commands using bash scripts.

Session 25:

- Case Study