Course Outline for CNT 55

MCSA I WINDOWS SERVER INSTALLATION, STORAGE, AND COMPUTE

Effective: Fall 2019

I. CATALOG DESCRIPTION:
   CNT 55 — MCSA I WINDOWS SERVER INSTALLATION, STORAGE, AND COMPUTE — 3.00 units

   This course prepares students for the Microsoft's Examination: Installation, Storage and Compute with Windows Server, which is the first of three exams a student must pass to obtain a MCSA (Microsoft Certified Solutions Associate) Certification. By passing this exam, one become a Microsoft Certified Professional (MCP) and gains access to MCP benefits. The MCSA Windows Server certification qualifies its holder for a position as a network or computer systems administrator or as a computer network specialist. The topics include installation, storage, and compute features and functionality available in the current Windows Server, Nano Server, images for deployment, storage solutions, data deduplication, high availability, disaster recovery, storage spaces direct, and failover clustering solutions. Also covered: Hyper-V and containers..

   2.50 Units Lecture 0.50 Units Lab

   Strongly Recommended
   CNT 52 - Networking Fundamentals
   with a minimum grade of C

   Grading Methods:
   Letter or P/NP

   Discipline:
   • Computer Service Technology

	MIN
Lecture Hours:	45.00
Expected Outside of Class Hours:	90.00
Lab Hours:	27.00
Total Hours:	162.00

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: 1

III. PREREQUISITE AND/OR ADVISORY SKILLS:

   Before entering this course, it is strongly recommended that the student should be able to:

   A. CNT52
      1. list and explain the layers of the OSI model and the TCP/IP Stack and desribe the roles of protocol layers in data networks;
      2. describe and differentiate the devices, protocols, and services used to support communications in data networks and the Internet;
      3. calculate both IPv4 and IP6 subnets, and segment a large network into smaller parts;
      4. evaluate the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments;
      5. design and assemble an Ethernet network and a wireless network, including routers, switches, and cables;
      6. explain Ethernet topologies, and relevant IEEE hardware and software specifications;
      7. describe the major functions of LAN hardware protocols such as Ethernet; and WAN protocols such as T-series, DSL, ATM, and Frame Relay;

IV. MEASURABLE OBJECTIVES:
   Upon completion of this course, the student should be able to:

   A. Install and Configure Servers, Local Storage, and File & Share Access
   B. Configure Print and Document Services
   C. Configure Servers for Remote Management
   D. Create and Configuring Virtual Machine Settings, Storage, and Virtual Networks
   E. Configure IPv4 and IPv6 Addressing
   F. Deploy and Configuring the DHCP and DNS Services
   G. Install Domain Controllers with Active Directory

H. Create and Managing Active Directory Users, Groups and Organizational Units
I. Create Group Policy Objects, Security Policies, and Application Restriction Policies
J. Configure Windows Firewall

V. CONTENT:
    A. Install Windows Servers in Host and Compute Environments
        1. Install, upgrade, and migrate servers and workloads
            a. Determine Windows Server installation requirements
            b. Determine appropriate Windows Server editions per workloads
            c. Install Windows Server
            d. Install Windows Server features and roles
            e. Install and configure Windows Server Core
            f. Manage Windows Server Core installations using Windows PowerShell, command line, and remote management capabilities
            g. Implement Windows PowerShell Desired State Configuration (DSC) to install and maintain integrity of installed environments
            h. Perform upgrades and migrations of servers and core workloads from older Windows Servers to the current Windows Server
            i. Determine the appropriate activation model for server installation, such as Automatic Virtual Machine Activation (AVMA), Key Management Service (KMS), and Active Directory-based Activation
        2. Install and configure Nano Server
            a. Determine appropriate usage scenarios and requirements for Nano Server
            b. Install Nano Server
            c. Implement Roles and Features on Nano Server
            d. Using Nano Server Image Builder, manage and configure Nano Server
            e. Manage Nano Server remotely using MMC, Windows PowerShell, and Server Management Tools
        3. Create, manage, and maintain images for deployment
            a. Plan for Windows Server virtualization
            b. Assess virtualization workloads using the Microsoft Assessment and Planning (MAP) Toolkit
            c. Determine considerations for deploying workloads into virtualized environments
            d. Update images with patches, hotfixes, last cumulative updates and drivers
            e. Install roles and features in offline images
            f. Manage and maintain Windows Server Core, Nano Server images, and VHDs using Windows PowerShell
    B. Implement Storage Solutions
        1. Configure disks and volumes
            a. Configure sector sizes appropriate for various workloads
            b. Configure GUID partition table (GPT) disks
            c. Create VHD and VHDX files using Disk Management or Windows PowerShell
            d. Mount virtual hard disks
            e. Determine when to use NTFS and ReFS file systems
            f. Configure NFS and SMB shares using Server Manager
            g. Configure SMB share and session settings using Windows PowerShell
            h. Configure SMB server and SMB client configuration settings using Windows PowerShell
            i. Configure file and folder permissions
        2. Implement server storage
            a. Configure storage pools
            b. Implement simple, mirror, and parity storage layout options for disks or enclosures
            c. Expand storage pools
            d. Configure Tiered Storage
            e. Configure iSCSI target and initiator
            f. Configure iSNS
            g. Configure Datacenter Bridging (DCB)
            h. Configure Multi-Path IO (MPIO)
            i. Determine usage scenarios for Storage Replica
            j. Implement Storage Replica for server-toserver, cluster-to-cluster, and stretch cluster scenarios
        3. Implement data deduplication
            a. Implement and configure deduplication
            b. Determine appropriate usage scenarios for deduplication
            c. Monitor deduplication
            d. Implement a backup and restore solution with deduplication
    C. Implement Hyper-V
        1. Install and configure Hyper-V
            a. Determine hardware and compatibility requirements for installing Hyper-V
            b. Install Hyper-V
            c. Install management tools
            d. Upgrade from existing versions of Hyper-V
            e. Delegate virtual machine management
            f. Perform remote management of Hyper-V hosts
            g. Using Windows PowerShell Direct
            h. Implement nested virtualization
        2. Configure virtual machine (VM) settings
            a. Add or remove memory in a running VM
            b. Configure dynamic memory
            c. Configure NonUniform Memory Access (NUMA) support
            d. Configure smart paging
            e. Configure Resource Metering
            f. Manage Integration Services
            g. Create and configure Generation 1 and 2 VMs and determine appropriate usage scenarios
            h. Implement enhanced session mode
            i. Create Linux and FreeBSD VMs
            j. Install and configure Linux Integration Services (LIS)
            k. Install and configure FreeBSD Integration Services (BIS)
            l. Implement Secure Boot for Windows and Linux environments
            m. Move and convert VMs from previous versions of Hyper-V to Windows Server Hyper-V
            n. Export and import VMs
            o. Implement Discrete Device Assignment (DDA), Troubleshoot VM configuration versions
        3. Configure Hyper-V storage
            a. Create VHDs and VHDX files using Hyper-V Manager
            b. Create shared VHDX files

  c. Configure differencing disks
  d. Modify virtual hard disks
  e. Configure pass-through disks
  f. Resize a virtual hard disk
  g. Manage checkpoints
  h. Implement production checkpoints
  i. Implement a virtual Fibre Channel adapter
  j. Configure storage Quality of Service (QoS)
 4. Configure Hyper-V networking
  a. Add and remove virtual network interface cards (vNICs); configure Hyper-V virtual switches
  b. Optimize network performance
  c. Configure MAC addresses
  d. Configure network isolation
  e. Configure synthetic and legacy virtual network adapters
  f. Configure NIC teaming in VMs
  g. Configure virtual machine queue (VMQ)
  h. Enable Remote Direct Memory Access (RDMA) on network adapters bound to a Hyper-V virtual switch using Switch Embedded Teaming (SET)
  i. Configure Bandwidth Management

D. Implement Windows Containers
 1. Deploy Windows containers
  a. Determine installation requirements and appropriate scenarios for Windows Containers
  b. Install and configure Windows Server container host in physical or virtualized environments
  c. Install and configure Windows Server container host to Windows Server Core or Nano Server in a physical or virtualized environment
  d. Install Docker on Windows Server and Nano Server
  e. Configure Docker start-up options
  f. Install PowerShell for Docker
  g. Install a base container image
  h. Tag an image
  i. Remove a container
  j. Create Windows Server containers
  k. Create Hyper-V containers
 2. Manage Windows containers
  a. Manage Windows containers by using Docker CLI and PowerShell for Docker
  b. Manage container networking
  c. Manage container data volumes
  d. Manage Resource Control
  e. Create new container images using Dockerfile
  f. Manage container images using DockerHub repository for public and private scenarios
  g. Manage container images using Microsoft Azure

E. Implement High Availability
 1. Implement high availability and disaster recovery options in Hyper-V
  a. Implement Hyper-V Replica
  b. Implement Live Migration
  c. Including Shared Nothing Live Migration
  d. Configure CredSSP or Kerberos authentication protocol for Live Migration
  e. Implement storage migration
 2. Implement failover clustering
  a. Implement Workgroup, Single, and Multi Domain clusters
  b. Configure quorum
  c. Configure cluster networking
  d. Restore single node or cluster configuration
  e. Configure cluster storage
  f. Implement Cluster-Aware Updating
  g. Implement Cluster Operating System Rolling Upgrade
  h. Configure and optimize cluster shared volumes (CSVs)
  i. Configure clusters without network names
  j. Implement Scale-Out File Server (SoFS)
  k. Determine different scenarios for the use of SoFS vs. File Server for general usez
  l. Determine usage scenarios for implementing guest clustering
  m. Iimplement a Clustered Storage Spaces solution using Shared SAS storage enclosures
  n. Implement Storage Replica
  o. Implement Cloud Witness
  p. Implement VM resiliency
  q. Implement shared VHDX as a storage solution for guest clusters
 3. Implement Storage Spaces Direct
  a. Determine scenario requirements for implementing Storage Spaces Direct
  b. Enable Storage Spaces Direct using Windows PowerShell
  c. Implement a disaggregated Storage Spaces Direct scenario
  d. Implement a hyper-converged Storage Spaces Direct scenario
 4. Manage failover clustering
  a. Configure role-specific settings, including continuously available shares
  b. Configure VM monitoring
  c. Configure failover and preference settings
  d. Implement stretch and site-aware failover clusters
  e. Enable and configure node fairness
 5. Manage VM movement in clustered nodes
  a. Perform a live migration
  b. Perform a quick migration
  c. Perform a storage migration
  d. Import, export, and copy VMs
  e. Configure VM network health protection
  f. Configure drain on shutdown
 6. Implement Network Load Balancing (NLB)
  a. Install NLB nodes
  b. Configure NLB prerequisites
  c. Configure affinity
  d. Configure port rules
  e. Configure cluster operation mode

     f. Upgrade an NLB cluster
  F. Maintain and Monitor Server Environments
    1. Maintain server installations
      a. Implement Windows Server Update Services (WSUS) solutions
      b. Configure WSUS groups
      c. Manage patch management in mixed environments
      d. Implement an antimalware solution with Windows Defender
      e. Integrate Windows Defender with WSUS and Windows Update
      f. Perform backup and restore operations using Windows Server Backup
      g. Determine backup strategies for different Windows Server roles and workloads, including Hyper-V Host, Hyper-V Guests, Active Directory, File Servers, and Web Servers using Windows Server native tools and solutions
    2. Monitor server installations
      a. Monitor workloads using Performance Monitor, Server Manager, Event Viewer
      b. Configure Data Collector Sets
      c. Determine appropriate CPU, memory, disk, and networking counters for storage and compute workloads
      d. Configure alerts
      e. Monitor workloads using Resource Monitor

VI. LAB CONTENT:
  A. Install Windows Servers in Host and Compute Environments
    1. Install, upgrade, and migrate servers and workloads
    2. Install and configure Nano Server
    3. Create, manage, and maintain images for deployment
  B. Implement Storage Solutions
    1. Configure disks and volumes
    2. Implement server storage
    3. Implement data deduplication
  C. Implement Hyper-V
    1. Install and configure Hyper-V
    2. Configure virtual machine (VM) settings
    3. Configure Hyper-V storage
    4. Configure Hyper-V networking
  D. Implement Windows Containers
    1. Deploy Windows containers
    2. Manage Windows containers
  E. Implement High Availability
    1. Implement high availability and disaster recovery options in Hyper-V
    2. Implement failover clustering
    3. Implement Storage Spaces Direct
    4. Manage failover clustering
    5. Manage VM movement in clustered nodes
    6. Implement Network Load Balancing (NLB)
  F. Maintain and Monitor Server Environments
    1. Maintain server installations
    2. Monitor server installations

VII. METHODS OF INSTRUCTION:
  A. **Lecture** -
  B. **Lab** -
  C. **Simulations** -
  D. **Demonstration** -

VIII. TYPICAL ASSIGNMENTS:
  A. Reading:
    1. Discuss Microsoft's Active Directory Services in relation to other industry standard network models for managing users and resources.
  B. Writing:
    1. Choose one of the topics from a list of Internet technologies and write a one-page technical discussion of the subject
  C. Project:
    1. Create an Active Directory Forest. Populate to the Organization Unit level with users and computers from the class.

IX. EVALUATION:
Methods/Frequency

  A. Exams/Tests
    7-15 per term
  B. Simulation
    10-20 per term
  C. Home Work
    8-16 per term

X. TYPICAL TEXTS:
  1. Zacker , Craig . *Exam Ref 70-740 Installation, Storage and Compute with Windows Server 2016.* 1 ed., Microsoft Press, 2018.
  2. Panek , William . *MCSA Windows Server 2016: Exam 70-740, Exam 70-741, Exam 70-742 and Composite Upgrade Exam 70-743.* 2 ed., Sybex, 2018.
  3. Tomsho, Greg . *MCSA Guide to Installation, Storage, and Compute with Microsoft Windows Server2016, Exam 70-740.* 1 ed., Cengage Learning, 2018.

XI. OTHER MATERIALS REQUIRED OF STUDENTS:
  A. Internet Access to Virtual Labs.