CTI 140: VIRTUALIZATION CONCEPTS

COURSE DESCRIPTION:

Prerequisites: None
Corequisites: None

This course introduces operating system virtualization. Emphasis is placed on virtualization terminology, virtual machine storage, virtual networking and access control. Upon completion, students should be able to perform tasks related to installation, configuration and management of virtual machines.
Course Hours per Week: Class, 1. Lab, 4. Semester Hours Credit, 3.

LEARNING OUTCOMES:

Upon completing requirements for this course, the student will be able to:

A. Install virtual machines
    1. Explain basic operating system concepts.
    2. Compare multi-tasking, and single- and multi-user operating systems.
    3. Describe basic operating system components.
    4. Describe operating system virtualization in a typical networking environment.
    5. Create virtual machines.
    6. Install Windows and Linux operating systems on virtual computers.
B. Configure virtual machines
    1. Identify file management system purpose and function.
    2. Compare file systems used by different operating systems.
    3. Explain data storage technologies and media, including backup processes.
    4. Update and configure Windows and Linux operating systems on virtual computers.
C. Manage virtual machines
    1. Manage virtual machine resources.
    2. Demonstrate best practices for deploying applications in a virtual environment.
    3. Explain the importance of "availability" as it relates to virtual machines.

OUTLINE OF INSTRUCTION:

I.   Operating Systems Primer
    A. Operating System Concepts
    B. Components (kernel, resource managers, device drivers, applications)
    C. Types (single- vs. multi-tasking, single- vs. multi-user)
    D. History of OS Evolution
    E. Input/Output

II.   Understanding Virtualization

A. Virtualization Concepts
B. Moore's Law
C. Type I and Type II Hypervisors
D. Popek and Goldberg's Virtualization Theory
E. Benefits of Virtualizing Server Environments and ROI
F. Application Virtualization

III. Installing Virtual Machines
A. VMWare Workstation and Workstation Player
B. Oracle Virtualbox
C. Microsoft Hypervisor (Server and Workstation Environments)
D. ESX/VSphere
E. Virtualizing Physical Machines

IV. CPU and Memory Basics
A. Types of Physical CPU Architectures
B. Internal vs External Clock Speeds
C. Caching and Memory
D. Buses
E. Examining Memory in a Virtual Machine
F. Calculating and Configuring VM CPU and Memory Settings

V. Upgrading Operating Systems
A. Requirements and Compatibility
B. Upgrading vs. Full Installation
C. Upgrading in Corporate Settings

VI. Understanding File Systems
A. Storage Basics including Disk Utilization
B. Directory Structure
C. Permissions Concepts
D. Partitioning and Formatting
E. Storage Formats
F. Linux vs. Windows File Systems

VII. Virtualizing Storage Devices
A. Examining Storage in a Virtual Machine
B. Creating Virtual Storage Environments
C. Dynamic and Static Storage
D. Understanding RAID and Cloud Storage

VIII. Cloning and Copying
A. Redundancy vs. Backup
B. Cloning and Templates
C. Snapshots and Checkpoints

IX.   Managing Devices in Virtualization
   A. Utilizing Peripheral Devices in VM Environments
   B. VM Tools
   C. Configuring USB and Other Devices to Work with VMs

X.   Resource Sharing
   A. Sharing Data
   B. Drive Mapping
   C. Understanding Workgroups, Homegroups, and Domains
   D. Sharing through the Cloud

XI.   Early and Current Operating Systems
   E. DOS
   F. Windows
   G. MacOS
   H. UNIX/Linux