



Course Description

CNT4702 | Network Design and Planning | 4.00 credits

This upper division course, for students majoring in Information Systems Technology presents network design using layering. Students will learn how to apply cabling, topology, and architecture to design systems. Students will also learn how design impacts network performance and control issues such as congestion control, error control, and contention resolution. Prerequisite: CIS3360.

Course Competencies:

Competency 1: The student will examine network design methodologies and the lifecycle of a network by:

1. Examining the benefits of a hierarchical network model, including scalability, redundancy, performance, security, manageability, and maintainability
2. Interpreting design issues to consider when planning a network operating system
3. Developing a site survey, requirements review and environmental evaluation to determine enterprise needs, requirements and compliance issues
4. Selecting the best local area network (LAN), wide area network (WAN), virtual local area network (VLAN), and wireless technologies to use for the network that adheres to all established requirements
5. Selecting the network services and protocols to be used
6. Designing and documenting the required security controls and security policy
7. Selecting space requirements, power, HVAC (heating, ventilation, and air conditioning), and cabling needs for the network
8. Reviewing bandwidth requirements based on current and projected server processor volume

Competency 2: The student will design structured and modularized networks for the enterprise by:

1. Assessing current network models and strategies to determine the optimal network design
2. Selecting the network design using available network planning diagram tools, such as Cisco's Network Planning Solution (NPS)
3. Selecting the physical hardware needed for the network, including servers, workstations, racks, printers, routers, switches, wireless access devices, and other network infrastructure equipment
4. Setting a scalable network cabling plan
5. Designing and documenting network cabling implementation and installation plans
6. Writing a request for proposal (RFP) that includes Researching and preparing a list of materials
7. Conducting a cost analysis that contains pricing and vendor information

Competency 3: The student will design networks for remote connectivity with WAN technologies by:

1. Examining the types of remote connectivity options commonly used to access WAN and LAN technologies.
2. Researching and discussing evolving WAN technologies and how to implement them
3. Analyzing and recommending remote connectivity options with WAN technologies based on a scenario
4. Constructing the steps in setting up remote connectivity with WAN technologies, including Virtual Private Network (VPN) solutions
5. Configuring, establishing, documenting, and managing enterprise network connections to WANs.
6. Troubleshooting network servers, workstations, wireless access points, portable devices, routers, switches, and other network equipment
7. Troubleshooting connectivity errors
8. Documenting events and solutions in the system log

Competency 4: The student will design and implement Internet Protocol (IP) addressing schemes by:

1. Examining Internet Protocols, IP versions, IP addressing schemes, private networks, Network Address Translation (NAT), and routing protocols in common usage today
2. Comparing and contrasting the differences between dynamic and static IP address configuration
3. Implementing a network migration to a different IP addressing scheme and documenting the effects on the network and users
4. Implementing a dynamic IP addressing scheme for a given scenario, including IP versions 4 and 6, with DHCP servers in a Windows environment
5. Configuring IP addresses and network protocols for computers, servers, switches, routers, default gateways, and other network devices for specific networks given a scenario
6. Mapping IP network information and creating documentation

Competency 5: The student will evaluate and plan security solutions for the network by:

1. Designing security solutions for servers, computers, users, and other accounts, routers, switches, and other network devices in an enterprise network
2. Implementing security controls such as Firewalls, Access Control Lists (ACL), Mandatory Access Control (MAC) or Discretionary Access Control (DAC) to ensure user policies are enabled
3. Managing and implementing critical software updates that resolve known security vulnerabilities, secure network access, and assure network stability
4. Formulating and documenting security procedures for the network
5. Examining how an intrusion detection system (IDS) function
6. Installing, configuring, and monitoring an IDS
7. Examining security features in software programs and operating systems used on networks
8. Monitoring security aspects of operating systems, including self-metering, security keys, and required configuration settings
9. Implementing a full security audit program, that includes authentication and authorization

Competency 6: The student will consider voice and video networking in a network infrastructure by:

1. Examining the design, implementation, and use of converged networks carrying data, VoIP (Voice over IP), and video traffic
2. Arguing voice and video networking solutions given a scenario
3. Describing video conferencing models that support video applications to be installed on user clients (including portable and mobile devices) that operate on the network infrastructure
4. Preparing a planning document for implementing a video conferencing solution on the enterprise network.
5. Planning and creating security procedures for a given video networking solution

Competency 7: The student will implement a controller-based wireless network to support portable and mobile devices by:

1. Examining wireless network technologies and designs in current use for enterprise networks
2. Examining methods of enabling and supporting wireless portable and mobile devices in the enterprise
3. Determining information and conducting a site survey for creating a detailed plan for wireless network service deployment and integration in the enterprise
4. Determining volume, bandwidth, and placement requirements for a functional wireless network in a mixed campus environment
5. Identifying hardware and software requirements for wireless network design, including routers, access points, repeaters, extenders, bridges, and other wireless devices
6. Designing a wireless network using planning and diagramming tools
7. Examining emerging wireless network technologies and planning their integration into existing wireless enterprise networks

Competency 8: The student will plan for virtualized resources and network storage capacity in an enterprise network by:

1. Examining the common implementation of virtualization in use today
2. Examining and implementing storage networking protocols, including Fiber Channel and iSCSI
3. Identifying network circumstances that would benefit from virtualization
4. Installing, configuring, and maintaining a virtualized server software operating system for use with client operating systems in virtual machines
5. Demonstrating the ability to create virtual drives with multiple operating systems
6. Preparing a planning document for the adoption, implementation, and maintenance of shared network storage resources optimized for an enterprise network
7. Demonstrating the ability to manage, maintain, and troubleshoot virtualized systems with virtualization tools
8. Implementing an audit program for all virtualized resources

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Use computer and emerging technologies effectively