

SOUTHEAST COMMUNITY COLLEGE
CONSTRUCTION MANUFACTURING AND TECHNOLOGY DIVISION
Electronic Systems Technology Program
Revision Date: August 23, 2021

I. CATALOG DESCRIPTION

Course Number: ELEC2867
Course Title: Enterprise Networking, Security, and Automation
Prerequisite(s): ELEC2760 and ELEC2761 or Electronics Program Director approval
Catalog Description: Enterprise Networking, Security, and Automation (ENSA) describes the architecture, components, operations, and security to scale for large, complex networks, including wide area network (WAN) technologies. With emphasizes in Network Security Concepts, Network virtualization, automation how to configure, Troubleshoot, secure enterprise network devices.
Credit Hours: 3.0
Class Hours: 38
Lab Hours: 23
Total Contact Hours: 61

II. COURSE OBJECTIVES: *Course will:*

- A. Take the skills and knowledge that the student learned in ITN and SWRE and apply them to wide area networks (WANs).
- B. WANs are large, complex networks that require advanced understanding of network operation and security. ENSA will introduce the student to two game-changing areas of networking: virtualization and automation.
- C. Be able to configure, troubleshoot, and secure enterprise network devices. The student will be versed in application programming interfaces (APIs) and the configuration management tools that make network automation possible
- D. Configure OSPF and OSPFv2, DHCP, NAT/PAT.

III. STUDENT LEARNING OUTCOMES AND GENERAL EDUCATION LEARNING OUTCOMES:

- A. Student Learning Outcomes: *Student will be able to:*
 - 1. Configure single-area OSPFv2 in both point-to-point and multiaccess networks.
 - 2. Mitigate threats and enhance network security using access control lists and security best practices.
 - 3. Implement standard IPv4 ACLs to filter traffic and secure administrative access.
 - 4. Configure NAT services on the edge router to provide IPv4 address scalability.
 - 5. Demonstrate techniques to provide address scalability and secure remote access for WANs.
 - 6. Demonstrate how to optimize, monitor, and troubleshoot scalable network architectures.
 - 7. Describe how networking devices implement QoS.
 - 8. Implement protocols to manage the network.
 - 9. Describe how technologies such as virtualization, software defined networking, and automation affect evolving networks.
- B. General Education Learning Outcomes (GELOs)
 - 1. GELO #3: Critical Thinking & Problem Solving
Outcome 2: Synthesize information to arrive at reasoned solutions to problems.

IV. CONTENT/TOPICAL OUTLINE

- A. Single-Area OSPF**
 - 1. OSPF Features and Characteristics
 - 2. OSPF Packets
 - 3. OSPF Operation
 - 4. OSPF Router ID
 - 5. Point to Point OSPF Networks
 - 6. Multiaccess OSPF Networks
 - 7. Modify Single-Area SDPFv2
 - 8. Default Route Propagation
- B. Network Security Concepts**
 - 1. Current state of Cybersecurity
 - 2. Threat Actors and tools
 - 3. Malware
 - 4. Current network attacks
 - 5. IP Vulnerabilities and Threats
 - 6. TCP and UDP Vulnerabilities
 - 7. IP Services
 - 8. Network Security best practices
 - 9. Cryptography
- C. Access Control List (ACL)**
 - 1. Purpose of ACL
 - 2. Wildcard Masks in ACL
 - 3. Guidelines for ACL Creation
 - 4. Types of IPv4 ACL
 - 5. Configure and modify IPv4 ACL
 - 6. Secure VTY Ports with a Standard IPv4 ACL
 - 7. Configure and Modify Extended IPv4 ACL
- D. Network Address Translation (NAT) & Port Address Translation (PAT)**
 - 1. NAT Characteristics
 - 2. Types of NAT
 - 3. Advantages and Disadvantages of NAT
 - 4. Static NAT
 - 5. Dynamic NAT
 - 6. PAT
 - 7. NAT64
- E. WAN Concepts**
 - 1. Purpose of WANs
 - 2. WAN Operations
 - 3. Traditional WAN Connectivity
 - 4. Modern WAN Connectivity
 - 5. Internet-Based Connectivity
- F. VPN and IPsec Concepts**
 - 1. VPN Technology
 - 2. Types of VPN
 - 3. IPsec
- G. QoS Concepts**
 - 1. Network Transmission Quality
 - 2. Traffic Characteristics
 - 3. Queuing Algorithms

- 4. QoS Models
- 5. QoS Implementation Techniques
- H. Network Management
 - 1. Device Discovery with CDP
 - 2. Device Discovery with LLDP
 - 3. NTP
 - 4. SNMP
 - 5. Syslog
 - 6. Router and Switch file maintenance
 - 7. IOS Image Management
- I. Network Design
 - 1. Hierarchical Networks
 - 2. Scalable Networks
 - 3. Switch Hardware
 - 4. Router Hardware
- J. Network Troubleshooting
 - 1. Network Documentation
 - 2. Troubleshooting Process
 - 3. Troubleshooting Tools
 - 4. Symptoms and Causes of Network Problems
 - 5. Troubleshooting IP Connectivity
- K. Network Virtualization
 - 1. Cloud Computing and Virtualization
 - 2. Virtual Network Infrastructure
 - 3. Software-Defined Networking
 - 4. Controllers
- L. Network Automation
 - 1. Automation overview
 - 2. Data Formats
 - 3. APIs
 - 4. REST
 - 5. Configuration Management Tools
 - 6. IBN and Cisco DAN center
- M. SBA and Online Final Exams

V. INSTRUCTIONAL MATERIALS

- A. Required Text(s): None
- B. Other Resources: Cisco online curriculum – Scaling Networks, Computers (server and workstation), Routers and Switches, Various Internet sites, Optional study books, and CCNA Flash cards.

VI. METHODS OF PRESENTATION/INSTRUCTION

- A. Methods of presentation typically include a combination of the following:
 - 1. Technology enhanced Lecture
 - 2. Classroom discussion
 - 3. Interactive group activities
 - 4. Auto visual materials
 - 5. Presentation by experts for the Electronics and Networking industry
 - 6. Configuration and setting up network equipment both hardware and/or emulation software

VII. METHODS OF EVALUATION

- A.** Methods of evaluation, although determined by the individual instructor, traditionally includes a combination of the following:
 - 1.** Attendance and participation
 - 2.** Daily assignments
 - 3.** Written exams and/or quizzes
 - 4.** Performance and observational assessment

VIII. SPECIFIC COURSE REQUIREMENTS

- A.** Minimum grade of 60% is required.
- B.** All students must pass Student Based Assessment (SBA or Lab Test) to receive a grade for the class, failure to complete SBA is automatic failing grade for class.
- C.** Credit by Examination: Credit for the course CANNOT be earned through Credit by Examination.