



MERCER
COUNTY COMMUNITY COLLEGE

COURSE OUTLINE

Course Number NET130	Course Title Routing and Switching Essentials	Credits 3
Hours: Lecture/Lab/Other 2/2/0	Pre-requisite NET104	Implementation Semester & Year Fall 2022

Catalog description:

Study of the concepts and commands required to configure switches and routers in multiprotocol internetworks. Identifies solutions for small to medium-sized businesses, with procedures to configure multirouter, multigroup internetworks using LAN/WAN interfaces for common routed protocols. Also covers installation, configuration, and troubleshooting essentials required by technicians to install and maintain these devices. Hands-on exercises reinforce Cisco certification exam objectives.

General Education Category:
Not GenEd

Course coordinator:
Winston H. Maddox, Professor
Networking, Information Technology and Cybersecurity
609.570.3867, maddoxw@mccc.edu

Required texts & Other materials:

CompTIA – TESTOut Web Material ISBN:(978-1-935080-55-8)

Course Student Learning Outcomes (SLO):

Upon successful completion of this course, the student will be able to:

1. Explain implemented of switches and routers on LAN and WAN configurations.
[Supports ILG # 4; PLO # 1, 3]
2. Apply Cisco software to identify addresses, protocols, and connectivity status in a network containing multiple interconnected Cisco devices. [Supports ILG # 2, 4, 9; PLO # 2, 4, 6]
3. Interconnect Cisco switches and routers according to a given network design specification.
Supports ILG # 4; PLO # 3, 5]
4. Configure Cisco switches and routers to support a specified list of protocols and technologies.
[Supports ILG # 2, 4, 11; PLO #4, 5]
5. Configure access lists to control access to network devices or segments and general network traffic.
[Supports ILG # 9, 11; PLO # 4, 5,]
6. Verify Cisco switches and routers, configured network services and protocols, operate as intended within a given network specification. [Supports ILG # 9, 11; PLO # 5, 6, 7]

Course-specific Institutional Learning Goals (ILG):

Institutional Learning Goal 2. Mathematics. Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

Institutional Learning Goal 4. Technology. Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

Institutional Learning Goal 9. Ethical Reasoning and Action. Students will understand ethical frameworks, issues, and situations.

Institutional Learning Goal 11. Critical Thinking: Students will use critical thinking skills understand, analyze, or apply information or solve problems.

Program Learning Outcomes (PLO) for Information Technology – Cybersecurity Concentration (A.A.S.)

1. Describe the elements of information security, including possible threats and attack vectors as well as the motives, goals, and objectives of information security attacks;
2. Explain what steps can be taken to secure a system, and provide secure network management and reporting;
3. Secure routers and switches and their associated networks, including installing, troubleshooting, and monitoring network devices to maintain integrity, confidentiality, and availability of data and devices;
4. Prevent common security threats, including implementing firewall and VPN technologies and perimeter defenses, conducting vulnerability and penetration testing, and scanning networked systems;
5. Describe the security weaknesses inherent in wireless networks, and implement solutions to address them;
6. Use printed and online technical documentation, and demonstrate written and oral communication skills;
7. Work effectively individually and in workgroups to install and implement information security technology

Units of study in detail – Unit Student Learning Outcomes:

Unit I [INTRODUCTION TO ROUTING AND SWITCHING] [Supports Course SLO # 1]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Routing and Switching Overview
- Routing Simulator
- New Lab Structures
- Cisco Device Methods

Unit II [Networking Concepts] [Supports Course SLOs # 2, 5]

Learning Objectives

The student will be able to... Explain and Demonstrate

- TCP/IP Networking Model
- OSI Networking Model
- Networking Basics
- Data Encapsulation and Communications
- Ethernet Topologies

Unit III [Cisco Devices] [Supports Course SLO # 3]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Cisco Device Connection
- Command Line Interface
- ISO Licensing
- Device Settings
- Device Passwords
- Cisco Discovery Protocol

Unit IV **[IP Addressing]** [Supports Course SLO # 4]

Learning Objectives

The student will be able to... Explain and Demonstrate

- IPv4 Addressing Overview
- Subnets
- Subnet Planning and Design
- Route Summarization
- IPv6 Addressing
- Dynamic Host Configuration Protocol (DHCP)
- Domain Name System 9DNS)

Unit V **[Switching]** [Supports Course SLO # 4, 5]

Learning Objectives

The student will be able to...: Explain and Demonstrate

- Layer 2 Switching Overview
- Switch Operations
- Switching Methods
- Switch Interface Configuration
- Configure Switch Ports

Unit VI **[IPv4 Routing]** [Supports Course SLO # 4]

Learning Objectives

The student will be able to... Explain and Demonstrate

- IPv4 Routing Overview
- Static Routing
- Dynamic Routing
- IPv4 Routing Troubleshooting
- Network Communications

Unit VII **[IPv4 Routing Protocols]** [Supports Course SLO # 3]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Open Shortest Path First (OSPF)
- OSPF for IPv4
- OSPF Configuration
- LSA Types and Databases
- Adjacency Troubleshooting
- EIGRP for IPv4 Routing Overview

Unit VIII **[IPv6 Routing]** [Supports Course SLO # 5, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- IPv6Overview
- Explore IPv6 Addressing on Routers
- Common IPv6 Troubleshooting
- EIGRPv6
- Configure EIGRPv3 Routing Functionality

Unit IX [Wireless Networks] [Supports Course SLO # 4, 5,]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Define Wireless Concepts
- Wireless Standards
- Configure Bluetooth Connections
- Wireless Network Design
- Network Implementations
- SOHO Configurations

Unit X [WAN Implementation] [Supports Course SLO # 3 ,6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Explain Wan Types
- Discuss leased WAN Links
- Network Address Translation (NAT)
- Configure and Setup Dynamic NAT
- Set Up Port Address Translation (PAT)
- Serial WAN Link Troubleshooting

Unit XI [Advanced Switching] [Supports Course SLO # 4, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Explain Virtual LANs (VLANs)
- Explain Trunking Technology
- Advanced Trunking Configurations
- VLAN Trunking Protocol (VTP)
- Spanning Tree Protocol Configurations
- Router-on-a-Stick InterVLAN Routing

Unit XII [Access Control List] [Supports Course SLO # 3, 4, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- ACL Overview Standards
- Set Up Standards ACLs
- Filter Inbound Remote Access
- IPv6 and Extended ACLs
- Command Format
- Extended Access List Configuration

Unit XIII [Network Management] [Supports Course SLO # 3, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Network Time Protocol (NTP)
- System Message Log
- Simple Network Management Protocol
- Net Flow Overview
- Enterprise Networking
- Cloud Resources

Unit XIV [Network Security] [Supports Course SLO #4, 5, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Network Threads Overview
- Network Security Using AAA
- Wireless Network Security Practices
- Switch Security Overview Malware / Combat Malware
- Sniffing, Hacking, Denial of Service (DoS)

Unit XIV [Cryptography] [Supports Course SLO # 4,5, 6]

Learning Objectives

The student will be able to... Explain and Demonstrate

- Cryptography Overview
- Symmetric Encryption Overview
- Public Key Infrastructure
- Cryptanalysis and Cryptographic Attack Countermeasures

Evaluation of student learning:

Evaluation of student learning: [Evaluates SLOs #1, 2, 3, 4, 5, 6]

Students' achievement of the course objectives evaluated through use of the following:

- TESTOut Lab assignments assessing students' hardware comprehension skills related to the unit objectives.
- TESTOut Lab Chapter quizzes assessing students' comprehension of software computer concepts related to the unit objectives.
- Research and Final Research presentation assessing students' comprehension through the use of word, PowerPoint and graphics to demonstrate knowledge
- Basic programming Labs and Quizzes assignments assessing students' basic comprehension of cyber defense and analysis functions and skills related to the unit objectives.
- Exams and Final Research Presentation assessing students' comprehension of computer concepts and applications related to the unit objectives.

Grade Criteria

Item	Percent	Description
TESTOut Labs	10%	Activity-based lab Assignment Cyber Analysis
TESTOut Quizzes	10%	15 Question quiz for each unit of Cyber Defense Concepts
Exams	35%	3 Assignment based on your IT Topics leading to the final project
Final Research Presentation	45%	Professional Cyber Analysis Presentation