

COURSE SYLLABUS

LAST REVIEW	Fall 2022
COURSE TITLE	Applied Networking 1
COURSE NUMBER	CRTE 0115
DIVISION	Career and Technical Education
DEPARTMENT	CRTE
CIP CODE	11.1006
CREDIT HOURS	2
CONTACT HOURS/WEEK	Class: 2 Lab:
PREREQUISITES	None

COURSE DESCRIPTION

As the course title states, the focus of this course is on learning the fundamentals of networking. In this course, you will learn both the practical and conceptual skills that build the foundation for understanding basic networking. Students will examine human versus network communication and see the parallels between them. Students will be introduced to the two major models used to plan and implement networks, OSI and TCP/IP. Students will gain an understanding of the "layered" approach to networks. Students will examine the OSI and TCP/IP layers in detail to understand their functions and services. Students will become familiar with the various network devices and network addressing schemes. Students will discover the types of media used to carry data across the network. By the end of this course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

PROGRAM ALIGNMENT

This course is part of a program aligned through the Kansas Board of Regents and Technical Education Authority. For more information, please visit:

https://kansasregents.org/workforce_development/program-alignment

PROGRAM LEARNING OUTCOMES

1. Students will be able to configure a router and a switch for basic functionality
2. Students will be able to configure, monitor and troubleshoot access controls lists for various addressing methods
3. Students will be able to build, maintain and troubleshoot server hardware and software technologies
4. Students will be able to explain and enforce basic concepts of computer network security

TEXTBOOKS

<http://kckccbookstore.com/>

METHODS OF INSTRUCTION

A variety of instructional methods may be used depending on content area. These include but are not limited to: lecture, multimedia, cooperative/collaborative learning, labs and demonstrations, projects and presentations, speeches, debates, panels, conferencing, performances, and learning experiences outside the classroom. Methodology will be selected to best meet student needs.

COURSE OUTLINE

- I. Network Component Representations and Functions
 - A. Identify the common components of a network
 - B. Network Representation
 - C. Mapping the Internet
 - D. Reliable Networks - Network Architecture Requirements
 - E. Network Security Terminology
 - F. Researching IT and Networking Job Opportunities
- II. Configuring a Network Operating System
 - A. It Is Just an Operating System!
 - B. Access Methods
 - C. Navigating the IOS
 - D. Establishing a Console Session with Tera Term, Putty or Hyperterm
 - E. Configure IOS Hostname
 - F. Configuring Encrypted Password Display
 - G. Configuration Files
 - H. Configuring Initial Switch Settings
 - I. Configuring a Switch Virtual Interface
 - J. Automatic IP Address Configuration for End Devices
 - K. Implementing Basic Connectivity
 - L. Test the Loopback Address on an End Device
 - M. Verifying the VLAN Interface Assignment
 - N. Testing End-to-End Connectivity
 - O. Building a Simple Network
 - P. Configuring a Switch Management Address
- III. Network Protocols and Communications
 - A. Let's just talk about this
 - B. Mapping the Protocols of the TCP/IP Suite
 - C. Researching Network Standards
 - D. Standards Body Scavenger Hunt
 - E. Identify Layers and Functions
 - F. Investigating the TCP/IP and OSI Models in Action
 - G. Researching RFCs
 - H. Identify the PDU Layer
 - I. Explore a Network
 - J. Using Wireshark to View Network Traffic
 - K. Role of Protocols.
- IV. Network Access
 - A. Managing the Medium
 - B. Identifying Network Devices and Cabling
 - C. Physical Layer Terminology
 - D. Copper Media Characteristics
 - E. Cable Pinouts

- F. Building an Ethernet Crossover Cable
- G. Fiber Optics Terminology
- H. Connecting a Wired and Wireless LAN
- I. Viewing Wired and Wireless NIC Information
- J. Generic Frame Fields
- K. Data Link Layer Standards Organizations
- L. Logical and Physical Topologies
- M. Frame Fields
- N. Map physical network cabling and technology types to a simple floorplan blueprint.

V. Ethernet

- A. The impact of ARP requests on network and host performance.
- B. MAC and LLC Sublayers
- C. Ethernet Frame Fields
- D. Viewing Network Device MAC Addresses
- E. Using Wireshark to Examine Ethernet Frames
- F. Identify MAC and IP Addresses .
- G. Examine the ARP Table
- H. Observing ARP with the Windows CLI, IOS CLI, and Wireshark .
- I. Frame Forwarding Methods
- J. Determine how the switch forwards a frame based on the source MAC and destination.
- K. Viewing the Switch MAC Address Table
- L. Configure Layer 3 Switches
- M. MAC and Choose

VI. Network Layer

- A. How network devices use routing tables to direct packets to a destination network.
- B. IP Characteristics
- C. IPv4 Header Fields
- D. IPv6 Header Fields
- E. Identify Elements of a Host Routing Table Entry
- F. Identify Elements of a Router Routing Table Entry
- G. View Host Routing Tables
- H. Identify Router Components
- I. Exploring Router Physical Characteristics
- J. Exploring Internetworking Devices
- K. The Router Boot Process
- L. Router Configuration Steps
- M. Configure Initial Router Settings
- N. Configure LAN Interfaces
- O. Default Gateway on a Switch
- P. Connect a Router to a LAN
- Q. Troubleshooting Default Gateway Issues
- R. Building a Switch and Router Network
- S. Can You Read This Map?

VII. Transportation Layer

- A. Explain how transport layer protocols and services support communications across data networks.
- B. TCP, UDP, or Both

- C. Compare TCP and UDP Characteristics
- D. Using Wireshark to Observe the TCP 3-Way Handshake
- E. TCP Connection and Termination Process
- F. Using Wireshark to Examine a UDP DNS Capture
- G. Using Wireshark to Examine FTP and TFTP Captures
- H. Explain how transport layer protocols and services support communications across data networks.
- I. Packet Tracer Simulation - TCP and UDP Communications

VIII. IP Addressing

- A. The Internet of Everything (IoE)
- B. Binary to Decimal Conversions
- C. Decimal to Binary Conversion Activity
- D. Binary Game
- E. Using the Windows Calculator with Network Addresses
- F. Converting IPv4 Addresses to Binary
- G. ANDing to Determine the Network Address
- H. Unicast, Broadcast, or Multicast
- I. Calculate the Network, Broadcast, and Host Addresses
- J. Investigate Unicast, Broadcast, and Multicast Traffic
- K. Pass or Block IPv4 Addresses
- L. Public or Private IPv4 Addresses
- M. Identifying IPv4
- N. IPv4 and IPv6 Terms and Descriptions
- O. Practicing IPv6 Address Representations
- P. Identify Types of IPv6 Addresses
- Q. Static Configuration of a Global Unicast Address
- R. Verifying IPv6 Address Configuration
- S. Configuring IPv6 Addressing
- T. Identifying IPv6 Addresses
- U. Configuring IPv6 Addresses on Network Devices
- V. Verifying IPv4 and IPv6 Addressing
- W. Pinging and Tracing to Test the Path
- X. Testing Network Connectivity with Ping and Traceroute
- Y. Troubleshooting IPv4 and IPv6 Addressing

IX. Subnetting IP Networks

- A. Explain why routing is necessary for hosts on different subnets to communicate.
- B. Determining the Network Address - Basic
- C. Calculate the Number of Hosts - Basic
- D. Determining the Valid Addresses for Hosts - Basic
- E. Calculate the Subnet Mask
- F. Determining the Network Address - Advanced
- G. Calculating the Number of Hosts - Advanced
- H. Determining the Valid Addresses for Hosts - Advanced
- I. Determining the Number of Bits to Borrow
- J. Design an IP addressing scheme.
- K. Subnetting Scenario 2
- L. Calculating IPv4 Subnets
- M. Subnetting Network Topologies

- N. Researching Subnet Calculators
- O. Practicing VLSM
- P. Designing and Implementing a Subnetted IPv4 Addressing Scheme
- Q. Designing and Implementing a VLSM Addressing Scheme
- R. Designing and Implementing a VLSM Addressing Scheme
- S. Implementing a Subnetted IPv6 Addressing Scheme

X. Application Layer

- A. Explain the operation of the application layer in providing support to end-user applications.
- B. Application Protocols and Standards
- C. Researching Peer-to-Peer File Sharing
- D. Web and Email
- E. DNS CLI Commands in Windows and UNIX
- F. DNS and DHCP
- G. Observing DNS Resolution
- H. FTP
- I. Exploring FTP
- J. The operation of the application layer in providing support to end-user applications.
- K. Packet Tracer Multiuser Tutorial
- L. Packet Tracer Multiuser - Implement Services

XI. Network Planning

- A. How a small network of directly connected segments is created, configured, and verified.
- B. Identifying Network Planning and Design Factors
- C. Security Threats and Vulnerabilities
- D. Types of Attack
- E. Researching Network Security Threats
- F. Accessing Network Devices with SSH
- G. Securing Network Devices
- H. Test Connectivity with Traceroute
- I. Testing Network Latency with Ping and Traceroute
- J. Using show Commands
- K. Identify show commands as compared to stated scenarios.
- L. Using the CLI to Gather Network Device Information
- M. Backing up Configuration Files
- N. Establish connectivity to TFTP server.
- O. Managing Router Configuration Files with Tera Term
- P. Managing Device Configuration Files Using TFTP, Flash, and USB
- Q. Researching Password Recovery Procedures
- R. Configuring a Linksys Router
- S. Design and Build a Small Business Network

COURSE LEARNING OUTCOMES AND COMPETENCIES

Upon successful completion of this course, the student will:

- A. Identify network components.
 - 1. Identify the appropriate network components.
- B. Configure a network operating system

- 2. Perform configuration changes to a network device.
- C. Configure network protocols
 - 3. Configure protocols on a network device.
- D. Manage network access
 - 4. Build and utilize network cables.
- E. Describe ethernet
 - 5. Identify MAC and IP addresses.
- F. Identify the network layer functions
 - 6. Identify hosts elements in a host routing table.
 - 7. Identify router elements in a routing table.
 - 8. Configure LAN interfaces.
- G. Transportation layer functions
 - 9. Utilize wireshark to examine TCP handshakes
 - 10. Utilize wireshark to examine UDP, DNS, TFTP and FTP traffic.
- H. Describe IP addressing
 - 11. Describe network addressing.
 - 12. AND a network address and subnet.
- I. Perform network IP subnetting
 - 13. Subnet a basic a basic network address.
 - 14. Subnet an advanced network address.
- J. Identify application layer functions
 - 15. Describe the operation of the application layer.
- K. Plan out a network.
 - 16. Manage device configuration files.

ASSESSMENT OF COURSE LEARNING OUTCOMES AND COMPETENCIES

Student progress is evaluated through both formative and summative assessment methods. Specific details may be found in the instructor's course information document.

COLLEGE POLICIES AND PROCEDURES

Student Handbook

<https://www.kckcc.edu/files/docs/student-resources/student-handbook-and-code-of-conduct.pdf>

College Catalog

<https://www.kckcc.edu/academics/catalog/index.html>

College Policies and Statements

<https://www.kckcc.edu/about/policies-statements/index.html>

Accessibility and Accommodations

<https://www.kckcc.edu/academics/resources/student-accessibility-support-services/index.html>.