LAUSD Division of Adult and Career Education

Career Technical Education (CTE) Course Outline

Course Title:	Networking/2
Course Number:	74-65-53
Date:	August 2024
Industry Sector:	Information and Communication Technologies
Pathway:	Networking
CBEDS Title:	Network Engineering
CBEDS Code:	4604
Credits:	10

Hours:	Total
	135

Course Description:

This competency-based course is the second in a sequence of three courses designed to prepare students to pass the Cisco Certified Networking Associate (CCNA) examination. Technical instruction includes an introduction, safety, basic device configuration, switching concepts, virtual local area network, inter-VLAN routing, spanning tree protocol, etherchannel, DHCPv4, SLAAC and DHCPv6 concepts, FHRP concepts and configuration, LAN security concepts, switch security configuration, WLAN concepts and configuration, routing concepts, IP static routing, and employability skills and resume preparation. The competencies in this course are aligned with the California High School Academic Content Standards and the California Career Technical Education Model Curriculum Standards.

Prerequisites:	Enrollment requires successful completion of the Networking/1 (74-65-51) course.
NOTE:	For Perkins purposes, this course has been designated as a concentrator course. This course **cannot** be repeated once a student receives a Certificate of Completion.
A-G Approval	N/A
Methods of Instruction:	Lecture and discussion, demonstration and participation, multimedia presentations, individualized instruction, role-playing, guest speakers, field trips and field study experiences, projects
Student Evaluation:	Summative: end of section assessments.
Industry Certification:	N/A
Recommended Texts:	Odom, Wendell. <u>CCNA 200-301 Official Cert Guide, Volume 1, 2nd Edition</u>. Cisco Press, 2024 Odom, Wendall, Hucaby, David, and Gooley, Jason. <u>CCNA 200-301 Official Cert Guide, Volume 2, 2nd Edition</u>. Cisco Press, 2024 Odom, Wendall, Hucaby, David, and Gooley, Jason. <u>CCNA 200-301 Official Cert Guide Library, 2nd Edition</u>. Cisco Press, 2024
Link to Resource Folder	https://bit.ly/network2resources

Approved by: Renny L. Neyra, Executive Director

COMPETENCY AREAS AND STATEMENTS	MINIMAL COMPETENCIES	STANDARDS
A. INTRODUCTION REVIEW Understand, apply, and evaluate classroom and workplace policies and procedures. (2 hours)	1. Review the scope and purpose of the course. 2. Review and demonstrate Zoom, Schoology, and basic computer skills. 3. Review classroom policies and procedures. 4. Review, discuss, identify, research, and draw conclusions regarding the different career paths, occupations, employment outlook, and career advancements in the Information and Communications Technologies industry sector which have an impact on networking. 5. Review the opportunities available for promoting gender equity and the representation of non-traditional populations in the Information and Communications Technologies industry sector. 6. Review and recognize the importance of ethics, teamwork, respecting individual and cultural differences, and diversity in the workplace.	**Career Ready Practice:** 1, 2, 3, 4, 8, 9, 10, 11 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5, 2.8 Career Planning & Management: 3.1, 3.3, 3.4, 3.5 Technology: 4.2 Ethics & Legal Responsibilities: 8.4 Leadership & Teamwork: 9.3, 9.6 Demonstration & Application: 11.1 **CTE Pathway:** B2.2
B. SAFETY REVIEW Understand safety procedures and techniques in the Information and Communication	1. Review classroom and workplace procedures for first aid, emergencies, and accidents/injury prevention. 2. Review the California Occupational Safety and Health Administration (Cal/OSHA) workplace requirements for network technicians to maintain a safe and healthy working environment. 3. Review the use of the Safety Data Sheet (SDS) as it applies to the Information and Communication Technologies industry sector.	**Career Ready Practice:** 1, 2, 12 **CTE Anchor:** Academics: 1.0 Communications:

Technologies Industry Sector.
 	
(2 hours)
	4. Review personal safety when lifting, bending, or moving equipment and supplies.
	5. Review how each of the following insures a safe workplace:
	   a. employees' rights as they apply to job safety
	   b. employers' obligations as they apply to safety
	   c. safety laws as they apply to electrical tools
	6. Explain and sign the LAUSD Responsible Use Policy (RUP).
	7. Pass the safety test with 100% accuracy.
		2.1, 2.3, 2.5, 2.6
		Health & Safety:
		6.1, 6.2, 6.3, 6.4, 6.7
		
		CTE Pathway:
		B2.2

C. BASIC DEVICE CONFIGURATION
 	
Understand initial configuration for Cisco devices.
 	
(6 hours)
	1. Define and demonstrate the following terms:
	   a. Command Line Interface (CLI)
	   b. Console Connection
	   c. Terminal Emulation
	2. Configure devices by using security best practices.
	3. Configure initial security settings on a Cisco switch.
	4. Configure switch ports to meet network requirements.
	5. Configure basic settings on a router, using CLI, to route between two directly connected networks.
	6. Verify connectivity between two networks that are directly connected to a router.
	7. Pass a basic device configuration assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.2, 5.5
		Technical Knowledge & Skills:
		10.1, 10.5
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.1, B3.1, B3.5, B4.1, B4.5, B6.3, B8.1

D. SWITCHING CONCEPTS
 	
Understand and explain how a Layer 2 switch functions in a switched network.
 	
(6 hours)
	1. Define and demonstrate the following terms:
	  a. MAC address
	  b. collision domain
	  c. broadcast domain
	2. Explain how Layer 2 switches forward data.
	3. Explain how frames are forwarded in a switched network.
	4. Compare a collision domain to a broadcast domain.
	5. Pass a switching concepts assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Technical Knowledge & Skills:
		10.1
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.1, B1.5, B3.1, B3.3, B5.2

E. VIRTUAL LOCAL AREA NETWORK (VLAN)
 	
Understand, apply, and configure Virtual Local Area Network.
	1. Define and demonstrate the following terms:
	  a. Virtual Local Area Network (VLAN)
	  b. Local Area Network (LAN)
	  c. Dynamic Trunking Protocol (DTP)
	2. Form teams to implement and troubleshoot VLANs and trunking in a switched network.
	3. Explain the purpose of VLANs in a switched network and how VLANs improve security.
	4. Explain how a switch forwards frames based on VLAN configuration in a multi-switch environment.
	5. Configure a switch port to be assigned to a VLAN based on requirements.
	6. Configure a trunk port on a LAN switch.
	7. Configure DTP.
	8. Pass a VLANs assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 9, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.5
		Leadership & Teamwork:
		9.3, 9.7

		Technical Knowledge & Skills: 10.1, 10.8 Demonstration & Application: 11.1 CTE Pathway: B1.1, B1.3, B1.5, B3.2, B3.3, B4.3, B4.9, B5.1, B6.3, B7.2, B8.1
(10 hours)		
F. INTER-VLAN ROUTING Understand, apply, and configure Inter-VLAN routing.	1. Define and demonstrate the following terms: a. Inter-VLAN routing b. router on a stick c. Layer 3 switching 2. Describe options for configuring inter-VLAN routing using a diagram. 3. Form teams to configure and troubleshoot: a. router-on-a-stick inter-VLAN routing b. inter-VLAN routing using Layer 3 switching 4. Pass an inter-VLAN routing assessment with an 80% score or higher.	**Career Ready Practice:** 1, 2, 4, 5, 10 **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.1, 5.2, 5.3, 5.5, 5.6 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1, 10.5, 10.8 Demonstration & Application: 11.1 **CTE Pathway:** B1.1, B1.5, B3.1, B4.1, B4.9, B5.2, B7.2
(10 hours)		

| G. SPANNING TREE PROTOCOL

Understand and describe the purpose and the use of Spanning Tree Protocol.

(10 hours) | 1. Define and demonstrate the following terms:
 a. Spanning Tree Protocol (STP)
 b. Rapid Per VLAN Spanning Tree (PVST)+
 c. broadcast storms
2. Explain how STP enables redundancy in a Layer 2 (L2) network.
3. Explain common problems in a redundant, L2 switched network.
4. Explain how STP operates in a simple, switched network.
5. Explain how Rapid PVST+ operates.
6. Pass an STP assessment with an 80% score or higher. | **Career Ready Practice:**
1, 2, 4, 5, 10

CTE Anchor:
Academics:
1.0
Communications:
2.1, 2.3, 2.5
Technology:
4.2
Problem Solving & Critical Thinking:
5.1, 5.5
Technical Knowledge & Skills:
10.1, 10.8
Demonstration & Application:
11.1

CTE Pathway:
B1.1, B1.5, B2.1, B3.1, B4.3, B4.4, B5.1, B6.3, B7.2, B8.5 |
| H. ETHERCHANNEL

Understand, configure, troubleshoot, and describe how EtherChannel aggregates links and increases bandwidth. | 1. Define and demonstrate the following terms:
 a. EtherChannel
 b. Port Aggregation Protocol (PagP)
 c. Link Aggregation Control Protocol (LACP)
2. Describe EtherChannel technology.
3. Form teams to configure and troubleshoot EtherChannel on switched links.
4. Pass an EtherChannel assessment with an 80% score or higher. | **Career Ready Practice:**
1, 2, 4, 5, 10

CTE Anchor:
Academics:
1.0
Communications:
2.1, 2.3, 2.5
Technology:
4.2
Problem Solving & Critical Thinking: |

		5.1, 5.5
		Leadership & Teamwork: 9.3, 9.7
		Technical Knowledge & Skills: 10.1
		Demonstration & Application: 11.1
		CTE Pathway: B1.1, B1.5, B3.3, B4.1, B4.4, B5.2, B6.3, B7.2
(6 hours)		

I. DYNAMIC HOST CONFIGURATION PROTOCOL (DHCPv4) Understand, configure, troubleshoot, and describe how DHCP operates in a network.	1. Define and demonstrate the following terms:
	  a. Dynamic Host Configuration Protocol (DHCP)
	  b. Relay Agent
	  c. IPCONFIG command
	2. Explain, implement, and form teams to troubleshoot DHCPv4 to operate across multiple LANs and make informed decisions.
	3. Form teams to configure a router as a:
	  a. DHCPv4 server
	  b. DHCPv4 client
	4. Pass a DHCPv4 assessment with an 80% score or higher.
		Career Ready Practice: 1, 2, 4, 5, 10
		
		CTE Anchor: Academics: 1.0 Communications: 2.1, 2.3, 2.5 Technology: 4.2 Problem Solving & Critical Thinking: 5.2, 5.4, 5.6 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1, 10.5 Demonstration & Application: 11.1

(6 hours)		**CTE Pathway:** B1.1, B3.5, B4.1, B6.1

J. SLAAC AND DHCPv6 CONCEPTS
 	
Understand, configure, troubleshoot, and describe how an IPv6 host can acquire its IPv6 configuration.
	1. Define and demonstrate the following terms:
	  a. Stateful vs. Stateless
	  b. Stateless Address Auto Configuration (SLAAC)
	  c. DHCPv6
	2. Explain the operation of SLAAC.
	3. Form teams to configure, verify, and troubleshoot dynamic address allocation in IPv6 networks to make informed decisions.
	4. Explain how an IPv6 host can acquire its IPv6 configuration.
	5. Explain the operation of DHCPv6.
	6. Configure a stateful and stateless DHCPv6 server.
	7. Pass a SLAAC and DHCPv6 assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.2, 5.4, 5.6
		Leadership & Teamwork:
		9.3, 9.7
		Technical Knowledge & Skills:
		10.1, 10.5
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.1, B3.5, B4.1, B6.1

(10 hours)		

K. FIRST HOP REDUNDANCY PROTOCOLS CONCEPTS & CONFIGURATION
 	
Understand, configure, troubleshoot, and describe how FHRPs provide network redundancy.
	1. Define and demonstrate the following terms:
	  a. First Hop Redundancy Protocols (FHRP)
	  b. Hot Standby Router Protocol (HSRP)
	  c. Gateway Load Balancing Protocol (GLBP)
	  d. Virtual Router Redundancy Protocol (VRRP)
	2. Explain how FHRPs provide default gateway services in a redundant network.
	3. Explain the purpose and operation of first hop redundancy protocols.
	4. Form teams to configure, verify, and troubleshoot HSRP.
		Career Ready Practice:
		1, 2, 4, 5, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:

	5. Pass an FHRP concepts assessment with an 80% score or higher.	4.2 Problem Solving & Critical Thinking: 5.2, 5.4, 5.6 Leadership & Teamwork: 9.3, 9.7 Technical Knowledge & Skills: 10.1, 10.5 Demonstration & Application: 11.1 **CTE Pathway:** B1.1, B1.5, B3.1, B3.7,
(10 hours)		B4.1, B4.9, B8.5

L. LAN SECURITY CONCEPTS
 	
Understand and describe LAN security concepts.
	1. Define and demonstrate the following terms:
	  a. Authentication, Authorization, & Accounting (AAA)
	  b. Media Access Control (MAC)
	2. Explain how vulnerabilities compromise LAN security.
	3. Explain how to use endpoint security to mitigate attacks.
	4. Explain how AAA and 802.1x are used to authenticate LAN endpoints and devices.
	5. Identify Layer 2 vulnerabilities.
	6. Explain how a MAC address table attack compromises LAN security.
	7. Explain and ask significant questions about how LAN attacks compromise LAN security.
	8. Pass a LAN Security concepts assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving &
		Critical Thinking:
		5.1
		Technical
		Knowledge & Skills:
		10.1
		Demonstration &
		Application:
		11.1
		
		CTE Pathway:

		B1.1, B6.1, B8.2, B8.3, B8.4
(6 hours)		

M. SWITCH SECURITY CONFIGURATION
 	
Understand, configure, and verify techniques to mitigate LAN attacks.
	1. Define and demonstrate the following terms:
	  a. Address Resolution Protocol (ARP)
	  b. Portfast
	  c. Bridge Protocol Data Units (BPDU)
	  d. Dynamic Trunking Protocol (DTP)
	2. Form teams to configure, implement, and identify switch security methods to mitigate LAN attacks.
	3. Implement port security to mitigate MAC address table attacks.
	4. Form teams to configure:
	  a. DTP and native VLAN to mitigate VLAN attacks
	  b. DHCP snooping to mitigate DHCP attacks
	  c. ARP inspection to mitigate ARP attacks
	  d. Portfast and BPDU Guard to mitigate STP attacks
	5. Pass a switch security configuration assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.1
		Leadership & Teamwork:
		9.3, 9.7
		Technical Knowledge & Skills:
		10.1, 10.8
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.1, B3.3, B3.6, B4.1, B4.5, B6.3, B8.1, B8.5

(12 hours)		

N. WIRELESS LOCAL AREA NETWORK (WLAN) CONCEPTS
 	
Understand and describe WLAN technology and standards.
	1. Define and demonstrate the following terms:
	  a. Wireless Local Area Network (WLAN)
	  b. Wireless LAN Controller (WLC)
	  c. Control & Provisioning of Wireless Access Points (CAPWAP)
	  d. Access Point (AP)
	2. Explain how WLANs enable network connectivity.
	3. Describe WLAN technology and standards.
	4. Describe and diagram the components of a WLAN infrastructure.
		Career Ready Practice:
		1, 2, 4, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5

	5. Explain how wireless technology enables WLAN operation.
	6. Explain how a WLC uses CAPWAP to manage multiple APs.
	7. Describe the following concepts:
	   a. channel management in a WLAN
	   b. threats to WLANs
	   c. WLAN security mechanisms
	8. Pass an WLAN concepts assessment with an 80% score or higher.
		Technology:
		4.2
		Technical Knowled & Skills:
		10.1, 10.8
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.1, B2.1, B2.3, B3.1, B3.3, B4.1, B4.5, B7.2, B8.1, B8.4

(6 hours)		

O. WLAN CONFIGURATION
 	
Configure and apply WLAN technology and standards to create a WLAN.
	1. Define and demonstrate the following terms:
	   a. Wi-Fi Protected Access 2 Pre-Shared Key (WPA2 PSK)
	   b. Wired Equivalent Privacy (WEP)
	2. Implement a WLAN using a wireless router and WLC.
	3. Configure a WLAN to support a remote site.
	4. Configure AAA and 802.1x to authenticate WLAN endpoints and devices.
	5. Form teams to configure a WLC WLAN to use:
	   a. the management interface and WPA2 PSK authentication
	   b. a VLAN interface, a DHCP server, and WPA2 Enterprise authentication
	6. Form teams to troubleshoot common wireless configuration issues.
	7. Pass a WLAN configuration assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 9, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.1, 5.4, 5.5
		Leadership & Teamwork:
		9.3, 9.7
		Technical Knowledge & Skills:
		10.1, 10.5, 10.8
		Demonstration & Application:
		11.1
		
		CTE Pathway:

		B1.1, B1.4, B2.1, B2.3, B
		B3.6, B4.1, B4.3, B4.5,
(10 hours)		B4.8, B8.1

P. ROUTING CONCEPTS
 	
Explain and configure how routers use information to make routing decisions.
	1. Define and demonstrate the following terms:
	  a. static routing concept
	  b. dynamic routing concept
	2. Explain how routers:
	  a. use information in packets to make forwarding decisions
	  b. determine the best path
	  c. forward packets to the destination
	3. Configure basic routing on a Cisco IOS router.
	4. Describe the structure of a routing table.
	5. Form teams to troubleshoot and configure static and dynamic routes.
	6. Pass a routing concepts assessment with an 80% score or higher.
		Career Ready Practice:
		1, 2, 4, 5, 9, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.1, 5.4, 5.5
		Leadership & Teamwork:
		9.3, 9.7
		Technical Knowledge & Skills:
		10.1
		Demonstration & Application:
		11.1
		
		CTE Pathway:

(10 hours)		B1.1, B3.1, B3.5

Q. IP STATIC ROUTING
 	
Describe and configure IPv4 and IPv6 static routes.
	1. Define and describe the command syntax for static routes.
	2. Form teams to configure and troubleshoot IPv4 and IPv6:
	  a. static routes
	  b. default static routes
	  c. floating static route to provide a backup connection
	  d. static host routes that direct traffic to a specific host
		Career Ready Practice:
		1, 2, 4, 5, 9, 10
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5

	3. Pass an IP static routing assessment with an 80% score or higher.	Technology: 4.2 Problem Solving & Critical Thinking: 5.1, 5.4, 5.5 Leadership & Teamwork: 9.3, 9.7 Technical Knowled & Skills: 10.1 Demonstration & Application: 11.1 **CTE Pathway:** B1.1, B3.1, B3.5
(10 hours)		

R. EMPLOYABILITY SKILLS AND RESUME PREPARATION REVIEW
 	
Understand, apply, and evaluate the desired employability skills and resume preparation for networking technicians.
	1. Review employer requirements for soft skills such as:
	  a. attitude toward work
	  b. communication and collaboration
	  c. critical thinking, problem solving, and decision-making
	  d. customer service
	  e. diversity in the workplace
	  f. flexibility and adaptability
	  g. interpersonal skills
	  h. leadership and responsibility
	  i. punctuality and attendance
	  j. quality of work
	  k. respect, cultural and diversity differences
	  l. teamwork
	  m. time management
	  n. trust and ethical behavior
	  o. work ethic
	2. Review a career plan that reflects career interests, pathways, and post-secondary options.
	3. Revise a resume, cover letter and/or portfolio.
		Career Ready Practice: 1, 2, 3, 4, 5, 7, 8, 9, 10, **CTE Anchor:** Academics: 1.0 Communications: 2.1, 2.3, 2.4, 2.5 Career Planning & Management: 3.1, 3.2, 3.3, 3.4, 3.5, 3 3.8, 3.9 Technology: 4.1, 4.2, 4.3, 4.5 Problem Solving & Critical Thinking: 5.1, 5.4 Responsibility & Flexibility: 7.2, 7.3, 7.4, 7.7

	4. Review the role of online job searching platforms and career websites to make informed decisions.
	5. Review the importance of assessing social media account content for professionalism.
	6. Review and complete and/or review an on-line job application.
	7. Review and demonstrate interview skills to get the job:
	   a. do's and don'ts for job interviews
	   b. how to dress for the job
	8. Review and create sample follow-up letters.
	9. Review the importance of the continuous upgrading of job skills as it relates to:
	   a. certification, licensure, and/or renewal
	   b. professional organizations/events
	   c. industry associations and/or organized labor
		Ethics & Legal Responsibilities: 8.3, 8.4, 8.5
		Leadership & Teamwork: 9.1, 9.2, 9.3, 9.4, 9.6, 9.7
		Technical Knowledge & Skills: 10.1, 10.3
		Demonstration & Application: 11.1, 11.2, 11.5
		
		CTE Pathway: B.4.7

(3 hours)		

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