LAUSD Division of Adult and Career Education
Career Technical Education (CTE) Course Outline

Course Title:	CCNA Test Prep/Upgrade
Course Number:	74-65-57
Date:	August 2024
Industry Sector:	Information and Communication Technologies
Pathway:	Networking
CBEDS Title:	Network Engineering
CBEDS Code:	4604
Credits:	5

Hours:	**Total**
	90

Course Description:

This competency-based course is designed to prepare students to pass the Cisco Certified Networking Associate (CCNA) examination. Technical instruction includes an introduction review, safety review, network fundamentals, network access, IP connectivity, IP services, security fundamentals, network access, IP connectivity, IP services, security fundamentals, automation and programmability, employability skills and resume preparation, and entrepreneurial skills. 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/3 (74-65-55) course.
NOTE:	For Perkins purposes, this course has been designated as a **capstone** course. This course **can** 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:	Johnson, Allan. 31 Days Before your CCNA Exam: A Day-By-Day Review Guide for the CCNA 2001-301 Certification Exam, 1st Edition. Cisco Press, 2020 Odom, Wendell. CCNA 200-301 Official Cert Guide, Volume 1, 2nd Edition. Cisco Press, 2024 Odom, Wendall, Hucaby, David, and Gooley, Jason. CCNA 200-301 Official Cert Guide, Volume 2, 2nd Edition. Cisco Press, 2024 Odom, Wendall, Hucaby, David, and Gooley, Jason. CCNA 200-301 Official Cert Guide Library, 2nd Edition. Cisco Press, 2024
Link to Resource Folder	https://bit.ly/ccnatestprepresources

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.	**Career Ready Practice:** 1, 2, 12 **CTE Anchor:** Academics: 1.0 Communications:

Technologies Industry Sector.	3. Review the use of the Safety Data Sheet (SDS) as it applies to the Information and Communication Technologies industry sector.
	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 applying 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

(2 hours)		

C. NETWORK FUNDAMENTALS REVIEW
 	
Understand fundamental network concepts.
	1. Apply and demonstrate the role and function of the following network components:
	   a. routers
	   b. layer 2 and layer 3 switches
	   c. next generation firewalls and IPS
	   d. access points
	   e. controllers
	   f. endpoints
	   g. servers
	   h. PoE
	2. Describe and compare the characteristics of network topology architectures:
	   a. two-tier
	   b. three-tier
	   c. spine-leaf
	   d. WAN
	   e. small office/home office (SOHO)
	   f. On-premises and cloud
	3. Compare physical interface and cabling types:
	   a. single-mode fiber, multimode fiber, copper
	   b. connections (ethernet shared media and point-to-point)
	4. Identify interface and cable issues (collisions, errors, mismatch duplex, and/or speed).
	5. Compare TCP to UDP.
	6. Configure and verify IPv4 addressing and subnetting.
	7. Apply and demonstrate private IPv4 addressing.
	8. Configure and verify IPv6 addressing and prefix.
	9. Describe IPv6 address types:
	   a. unicast (global, unique local, and link local)
	   b. anycast
	   c. multicast
		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:
		5.8, 5.11, 5.12
		Technical Knowledge & Skills:
		10.5
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B2.1, B2.3, B3.1, B3.2, B3.3, B3.4, B3.5, B3.7
		B4.1, B4.3, B4.5, B5.1, B5.2, B6.1, B6.3, B7.2

	d. modified EUI 64
	10. Verify IP parameters for Client OS (Windows, Mac OS, Linux).
	11. Apply and demonstrate the following wireless principles:
	   a. non-overlapping Wi-Fi channels
	   b. SSID
	   c. RF
	   d. Encryption
	12. Explain virtualization fundamentals:
	   a. server virtualization
	   b. containers
	   c. VRFs
	13. Describe switching concepts:
	   a. MAC address learning and aging
	   b. frame switching
	   c. frame flooding
	   d. MAC address table
	14. Pass a network fundamentals assessment with an 80% score or higher.	

(15 hours)		

D. NETWORK ACCESS
 	
Understand and configure fundamental network protocols and applications.
	1. Configure and verify VLANs (normal range) spanning multiple switches:
	   a. access ports (data and voice)
	   b. default VLAN
	   c. InterVLAN connectivity
	2. Configure and verify interswitch connectivity:
	   a. trunk ports
	   b. 802.1Q
	   c. Native VLAN
	3. Configure and verify Layer 2 discovery protocols:
	   a. Cisco Discovery protocol
	   b. LLDP
	4. Configure and verify (Layer 2/Layer 3) EtherChannel (LACP, PAgP).
	5. Interpret basic operations of Rapid PVST+ Spanning Tree Protocol:
	   a. root port, root bridge (primary/secondary), and other port names
	   b. port states and roles
	   c. PortFast
	   d. root guard, loop guard, BPDU filter, and BPDU guard
	6. Describe Cisco wireless Architectures and AP modes.
	7. Describe physical infrastructure connections of WLAN components (AP, WLC, access/trunk ports, and LAG).
		Career Ready Practice:
		1, 2, 4, 5
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving & Critical Thinking:
		5.4, 5.9
		Technical Knowledge & Skills:
		10.5, 10.8
		
		CTE Pathway:
		B1.5, B2.1, B3.1, B3.4, B3.5, B3.6, B4.1, B4.5,

	8. Apply and configure network device management access (Telnet, SSH, HTTP, HTTPS, console, TACACS+/RADIUS, and cloud managed). 9. Interpret the wireless LAN GUI configuration for client connectivity, such as WLAN creation, security settings, QoS profiles, and advanced settings. 10. Pass a network access assessment with an 80% score or higher.	B5.2, B6.3, B7.2, B8.1, B8.2, B8.4, B8.5
(15 hours)		

E. IP CONNECTIVITY
 	
Configure and troubleshoot routing protocols.
 	
(15 hours)
	1. Interpret the components of a routing table:
	  a. routing protocol code
	  b. prefix
	  c. network mask
	  d. next hop
	  e. administrative distance
	  f. metric
	  g. gateway of last resort
	2. Determine how a router makes a forwarding decision by default:
	  a. longest prefix match
	  b. administrative distance
	  c. routing protocol metric
	3. Configure and verify IPv4 and IPv6 static routing:
	  a. default route
	  b. network route
	  c. host route
	  d. floating static
	4. Configure and verify single area OSPFv2:
	  a. neighbor adjacencies
	  b. point-to-point
	  c. broadcast (DR/BDR selection)
	  d. router ID
	5. Apply and demonstrate the purpose, functions, and concepts of first hop redundancy protocols.
	6. Pass an IP connectivity 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:
		5.4, 5.9
		Technical Knowledge & Skills:
		10.1, 10.5, 10.11, 10.12
		Demonstration & Application:
		11.1
		
		CTE Pathway:
		B1.5, B3.3, B3.5, B4.1, B4.3, B6.3, B7.2, B8.5

F. IP SERVICES Configure and troubleshoot IP services.	1. Configure and verify inside source NAT using static and pools. 2. Configure and verify NTP operating in a client and server mode. 3. Explain the role of DHCP and DNS within the network. 4. Explain the function of SNMP in network operations.	**Career Ready Practice:** 1, 2, 4, 5, 10 **CTE Anchor:** Academics:

	5. Describe the use of syslog features, including facilities and severity levels.
	6. Configure and verify DHCP client and relay.
	7. Explain the forwarding per-hop behavior (PHB) for QoS such as:
	    a. classification
	    b. marking
	    c. queuing
	    d. congestion
	    e. policing
	    f. shaping
	8. Configure network devices for remote access using SSH.
	9. Apply and demonstrate the capabilities and functions of TFTP/FTP in the network.
	10. Pass an IP services assessment with an 80% score or higher.
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving &
		Critical Thinking:
		5.4, 5.9
		Technical
		Knowledge & Skills:
		10.5
		Demonstration &
		Application:
		11.1
		
		CTE Pathway:
		B1.4, B1.5, B3.1, B3.2, B3.3, B3.4, B3.5, B4.1, B4.4, B6.1, B6.3, B8.5

(15 hours)		

G. SECURITY FUNDAMENTALS
 	
Understand and apply fundamental network security concepts and configurations.
	1. Explain key security concepts:
	    a. threats
	    b. vulnerabilities
	    c. exploits
	    d. mitigation techniques
	2. Describe security program elements:
	    a. user awareness
	    b. training
	    c. physical access control
	3. Configure and verify device access control using local passwords.
	4. Describe security password policy elements, such as:
	    a. management
	    b. complexity
	    c. password alternatives (multi-factor authentication, certificates, and biometrics)
	5. Describe IPsec remote access and site-to-site VPNs.
	6. Configure and verify access control lists.
	7. Configure and verify Layer 2 security features:
	    a. DHCP snooping
	    b. dynamic ARP inspection
	    c. port security
		Career Ready Practice:
		1, 2, 4, 5
		
		CTE Anchor:
		Academics:
		1.0
		Communications:
		2.1, 2.3, 2.5
		Technology:
		4.2
		Problem Solving &
		Critical Thinking:
		5.7
		Technical
		Knowledge & Skills:
		10.1, 10.8
		
		CTE Pathway:

	8. Compare authentication, authorization, and accounting concepts.
	9. Describe wireless security protocols:
	  a. WPA
	  b. WPA2
	  c. WPA3
	10. Configure and verify WLAN within the GUI using WPA2 PSK.
	11. Pass a security fundamentals assessment with an 80% score or higher.
		B1.1, B1.4, B2.1, B2.3, B3.1, B3.4, B3.5, B3.6, B4.5, B6.3, B8.1

(10 hours)		

H. AUTOMATION AND PROGRAMMABILITY
 	
Explain how network automation is enabled through APIs and configuration management tools.
	1. Explain how automation impacts network management.
	2. Compare traditional networks with controller-based networking.
	3. Describe controller-based, software defined architecture (overlay, underlay, and fabric):
	  a. separation of control plane and data plane
	  b. northbound and southbound APIs
	4. Explain AI (generative and predictive) and machine learning in network operations.
	5. Describe characteristics of REST-based APIs:
	  a. authentication types
	  b. CRUD
	  c. HTTP verbs
	  d. data encoding
	6. Recognize the capabilities of configuration management mechanisms, such as Ansible and Terraform.
	7. Recognize and assess the components of JSON-encoded data.
	8. Pass an automation and programmability 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, 4.6
		Problem Solving and Critical Thinking:
		5.4, 5.8.
		Technical Knowledge & Skills:
		10.1, 10.5, 10.12
		
		CTE Pathway:
		B1.1, B4.3, B4.7, B7.3

(10 hours)		

I. 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
		Career Ready Practice:
		1, 2, 3, 4, 5, 7, 8, 9, 10, 11
		
		CTE Anchor:
		Academics:
		1.0

	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.
	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
		Communications:
		2.1, 2.3, 2.4, 2.5
		Career Planning & Management:
		3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 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
		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)		
J. ENTREPRENEURIAL SKILLS Understand, apply, and evaluate the process involved in becoming an entrepreneur in the automotive industry.	1. Define entrepreneurship. 2. Identify and research the necessary characteristics of successful entrepreneurs. 3. Examine personal goals prior to starting a business. 4. Evaluate sources of monetary investment in a business opportunity. 5. Explain licensing/permit requirements for a business.	**Career Ready Practice:** 1, 2, 4, 10, 11 **CTE Anchor:** Academics: 1.0

	6. Explain how the Small Business Administration (SBA) assists entrepreneurs with lenders and funding to help them plan, start and grow a business. 7. Demonstrate a budget to identify start-up expenses. 8. Pass an entrepreneurial skills assessment with an 80% score or higher.	Communications: 2.1, 2.3, 2.5 Technology: 4.1, 4.2, 4.5 Responsibility & Flexibility: 7.1, 7.6 Technical Knowledge & Skills: 10.1, 10.3, 10.4 Demonstration & Application: 11.1, 11.2, 11.3, 11.4 **CTE Pathway:**
(4 hours)		B4.7

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Ana Martinez, Trung Le, Silvia Quijada, and Robert Yorgason