



2017-2018

CISCO Internetworking, Level 2

OUTLINE

DESCRIPTION:

This program uses industry based curriculum developed by the CISCO Corporation and is designed to prepare students for employment as computer network designers, installers, and network maintenance and technology support technicians. Students exiting the program may take certification tests through the CISCO Certified Internetworking Association.

In Level 2, students are introduced to various facets and functions of routers, including operating systems interface (OSI) model, wide area networks (WANs), router components, startup, setup, and use of routers, input-output system (IOS), transportation control protocol (TCP/IP), and routing protocols. Hands-on, laboratory activities focus on routers and input-output systems. Activities in this course include work-based learning that connects students to industry and the local community.

CISCO Internetworking, Level II has been UC a-g approved to meet the elective (“g” – Mathematics – Computer Science) requirement.

INFORMATION:

- A. Pre-requisite: Successful completion of CISCO Internetworking, Level 1
- B. Length: One semester
- C. Sector: Information and Communication Technologies
- D. Pathway: Networking

O*Net SOC Codes	
Code #	Title
15-1142.00	Network and Computer Systems Administrators
15-1151.00	Computer User Support Specialists
15-1152.00	Computer Network Support Specialist

Orientation
<ul style="list-style-type: none">A. Introduce the course and facilities.B. Discuss the syllabus and major objectives.C. Explain applicable classroom management procedures, the ROP Student Rules of Conduct, and any operational guidelines.D. Review instructor/student expectations.E. Explain enrollment and attendance requirements and procedures.F. Review grading and student evaluation procedures.G. Discuss the community classroom aspect of the program if applicable.H. Discuss the “next steps” related to additional education, training, and employment.I. Review classroom safety, emergency and disaster procedures.
1. Communication Skills
<ul style="list-style-type: none">A. Demonstrate positive verbal communication skills using appropriate vocabulary, demeanor, and vocal tone in the classroom and/or worksite.B. Read and interpret written information and directions.C. Practice various forms of written communication appropriate to the occupation.D. Practice positive body language skills.E. Practice professional verbal skills for resolving a conflict.F. Demonstrate active listening skills including techniques for checking for understanding, and for obtaining clarification of directions.
2. Interpersonal Skills
<ul style="list-style-type: none">A. Demonstrate positive teamwork skills by contributing to a group effort.B. Practice the importance of diversity awareness and sensitivity in the workplace.C. Define sexual harassment in the workplace and identify the employee’s role and responsibility.D. Practice participation skills.E. Identify different personality types and strategies for working effectively with each type.F. Practice business and social etiquette skills appropriate to the occupation.G. Discuss the role of business and personal ethics in the decision-making process.H. Evaluate various job-related scenarios and justify decisions based on ethics.I. Demonstrate flexibility and adaptability in working with others.J. Demonstrate the use of time management skills.

3. Personal and Occupational Safety
<ul style="list-style-type: none">A. Demonstrate procedures to be followed in the case of emergencies.B. Discuss ways to report a potential safety hazard to a supervisor.C. Identify and discuss cyber ethics, cyber safety, and cyber security.D. Apply personal safety practices to and from the job.E. Describe the procedure for reporting a work-related hazard or injury.F. Recognize the effects of substance abuse in the workplace.G. Recognize good housekeeping as a safety issue.H. Identify safety hazards commonly found in the workplace environment.I. Describe the procedures for reporting a work-related injury.J. Explain the importance of CAL-OSHA.K. Define and discuss ergonomics in relation to the working environment.L. Discuss the electrical hazards of working with electronic equipment.
4. Leadership
<ul style="list-style-type: none">A. Define leadership and identify the responsibilities, competencies, and behaviors of successful leaders.B. Work with peers to promote divergent and creative perspectives.C. Demonstrate how to organize and structure work, individually and in teams, for effective performance and the attainment of goals.D. Explain multiple approaches to conflict resolution and their appropriateness for a variety of situations in the workplace.E. Employ ethical behaviors and actions that positively influence others.F. Use a variety of means to positively impact the direction and actions of a team or organization.G. Analyze the short-term and long-term effects a leader's actions and attitudes can have on productivity, morale, and organizational culture.
5. WANs 1.1
<ul style="list-style-type: none">A. Identify organizations responsible for WAN standards.B. Describe the difference between a WAN and LAN and the type of addresses each uses.C. Describe the role of a router in a WAN.
6. Routers 1.2
<ul style="list-style-type: none">A. Identify internal components of the router and describe their functions.B. Describe the physical characteristics of the router.

- C. Identify common ports on a router.
- D. Properly connect Ethernet, serial WAN, and console ports.

7. Operating Cisco IOS Software 2.1

- A. Describe the basic operation and features of the IOS.
- B. Describe the purpose of the IOS.

8. Starting a Router 2.2

- A. Log into a router using CLI and troubleshoot command errors.
- B. Use the help feature in the command line interface.
- C. Use the show version command.
- D. Identify the methods to establish a command-line interface (CLI) session with the router.
- E. Move between the user command executive (EXEC) and the privileged EXEC modes.
- F. Use HyperTerminal to establish a session on a router.

9. Configuring a Router 3.1

- A. Name a router.
- B. Set passwords.
- C. Examine show commands.
- D. Configure a serial interface.
- E. Configure an Ethernet interface.

10. Finishing the Configuration 3.2

- A. Demonstrate techniques for backup and documentation.
- B. Execute and save changes to a router.
- C. Configure an interface description.
- D. Configure a message-of-the-day banner.
- E. Configure host tables.

11. Discovering and Connecting to Neighbors 4.1

- A. Enable and disable CDP.
- B. Use the show CDP neighbors command.

- C. Determine which neighboring devices are connected to which local interfaces.
- D. Gather network address information about neighboring devices using CDP.

12. Getting Information about Remote Devices 4.2

- A. Establish and verify a Telnet connection.
- B. Disconnect from a Telnet session.
- C. Suspend a Telnet session.
- D. Perform alternative connectivity tests.
- E. Troubleshoot remote terminal connections.

13. Router Boot Sequence and Verification 5.1

- A. Troubleshoot IOS boot failure.
- B. Identify the stages of the router boot sequence.
- C. Determine how a Cisco device locates and loads the Cisco IOS.
- D. Use the boot system command.
- E. Identify the configuration register values.

14. Managing the Cisco File System 5.2

- A. Save and restore configuration files using TFTP and copy-and-paste.
- B. Load an IOS image using TFTP.
- C. Load an IOS image using X-Modem.
- D. Verify the file system using show commands.
- E. Describe the files used by the Cisco IOS and their functions.
- F. List the locations on the router of the different file types.
- G. Describe the parts of the IOS name.

15. Introduction to Static Routing 6.1

- A. Configure, verify and troubleshoot static and default routes.
- B. Describe the significance of static routing.

16. Dynamic Routing Overview 6.2

- A. Identify the classes of routing protocols.

- B. Identify distance vector routing protocols.
- C. Identify link-state routing protocols.

17. Routing Protocols Overview 6.3

- A. Enable Routing Information Protocol (RIP) on a router.
- B. Describe the basic characteristics of common routing protocols.
- C. Identify interior and exterior gateway protocols.

18. Distance Vector Routing 7.1

- A. Describe how routing loops can occur in distance vector routing.
- B. Describe several methods used by distance vector routing protocols to ensure that routing information is accurate.

19. RIP 7.2

- A. Configure RIP.
- B. Use the "IP Classless" command.
- C. Troubleshoot RIP.
- D. Configure RIP for load balancing.
- E. Configure static routes for RIP.
- F. Verify RIP.

20. IGRP 7.3

- A. Configure, verify and troubleshoot IGRP.

21. Overview of TCP/IP Error Message 8.1

- A. Demonstrate the use of ICMP to troubleshoot connectivity errors.

22. TCP/IP Suite Control Message 8.2

- A. Describe ICMP control messages.
- B. Identify a variety of ICMP control messages used in networks today.
- C. Determine the causes for ICMP control messages.

23. Examining the Routing Table 9.1
<ul style="list-style-type: none">A. Use the show IP route command to gather detailed information about the routes installed on the router.B. Configure a default route or default network.C. Describe how a router uses both Layer 2 and Layer 3 addressing to move data through the network.
24. Network Testing 9.2
<ul style="list-style-type: none">A. Use the ping command to perform basic network connectivity tests.B. Use the telnet command to verify the application layer software between source and destination stations.
25. Troubleshooting Router Issues Overview 9.3
<ul style="list-style-type: none">A. Troubleshoot by sequential testing of OSI layers.B. Use the show interfaces command to confirm Layer 1 and Layer 2 problems.C. Use the show ip route and show IP protocol commands to identify routing issues.D. Use the show CDP command to verify Layer 2 connectivity.E. Use the trace-route command to identify the path packets take between networks.F. Use the show controller's serial command to ensure the proper cable is attached.G. Use basic debug commands to monitor router activity.
26. TCP Operation 10.1
<ul style="list-style-type: none">A. Describe TCP and its function.B. Describe TCP synchronization and flow control.C. Describe UDP operation and processes.D. Identify common port numbers.
27. Overview of Transport Layer Ports 10.2
<ul style="list-style-type: none">A. Describe multiple conversations between hosts.B. Identify ports used for services and clients.C. Describe port numbering and well known ports.D. Describe the differences and the relationship between MAC addresses, IP addresses, and port numbers.

28. Access Control List Fundamentals 11.1

- A. Describe the differences between standard and extended ACLs.
- B. Describe the rules for placement of ACLs.

29. Access Control Lists (ACL's) 11.2

- A. Create and apply named ACLs.
- B. Describe the function of firewalls.
- C. Use ACLs to restrict virtual terminal access.

Key Assignments

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
1. Students will configure and troubleshoot multiple routers and switches to fit to the physical and logical needs of network design.	1A-C				
	5A-C				
	6A-D				
	7A,B				
	8A,B				
	9A-F				
	10A-E				
	11A-D				
	12A-E				
	13A-E		4	B.2	RSTS 11-12.4
	14A-G	1	5	B.3	SLS 11-12.1
	15A,B	4	6	B.4	WS 11-12.6
	16A-C	5	7	B.5	WS 11-12.7
	17A-C	11	10	B.6	
	18A,B				
	19A-F				
	20A				
	21A				
	22A-C				
	23A-C				
	24A,B				
	25A-G				
	26A-D				

2017-2018

Assignment	Competencies	Career Ready Practices	Anchor Standards	Pathway Standards	CCSS
	27A-D				
2. Students will configure and troubleshoot control lists to secure network access.	1A-C 28A,B 29A-C	1 4 5 10	4 5 7 10	B7.0 B8.0	LS 11-12.6 SLS 11-12.1 SIC 6 WS 11-12.6 WS 11-12.7

Standards Assessed in this Program

Career Ready Practices

1. Apply appropriate technical skills and academic knowledge.
2. Communicate clearly, effectively, and with reason.
3. Develop an education and career plan aligned to personal goals.
4. Apply technology to enhance productivity.
5. Utilize critical thinking to make sense of problems and persevere in solving them.
6. Practice personal health and understand financial well-being.
7. Act as a responsible citizen in the workplace and the community.
8. Model integrity, ethical leadership, and effective management.
9. Work productively in teams while integrating cultural/global competence.
10. Demonstrate creativity and innovation.
11. Employ valid and reliable research strategies.
12. Understand the environmental, social, and economic impacts of decisions.

Anchor Standards

2.0 Communications

- Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0 Career Planning and Management

- Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0 Technology

- Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.

5.0 Problem Solving and Critical Thinking

- Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.

6.0 Health and Safety

- Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.

7.0 Responsibility and Flexibility

- Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.

8.0 Ethics and Legal Responsibilities

- Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.

9.0 Leadership and Teamwork

- Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.

10.0 Technical Knowledge and Skills

- Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Pathway Standards

Information and Communication Technologies- Networking Pathway

B2.0 Identify, describe, and implement network media and physical topologies.

B3.0 Install, configure, and differentiate between common network devices.

B4.0 Demonstrate proper network administration and management skills.

B5.0 Demonstrate how to communicate and interpret information clearly in industry-standard visual and written formats.

B6.0 Use and assess network communication applications and infrastructure.

B7.0 Analyze a customer's organizational needs and requirements to identify networking needs.

B8.0 Identify security threats to a network and describe general methods to mitigate those threats.

Common Core State Standards

ENGLISH LANGUAGE ARTS

Language Standards

LS 11-12.6: Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the (career and college) readiness level, demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards for Science and Technical Subjects

RSTS 11-12.4: Determine the meaning of symbols, key words, and other domain-specific words and phrases as they are used in a specific scientific or technical context.

Speaking and Listening Standards

SLS 11-12.2: Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions, and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

SLS 11-12.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners,

building on others ideas and expressing their own clearly and persuasively.

SLS 11-12.1d: Respond thoughtfully to diverse perspectives, synthesize comments, claims and evidence made on all sides of an issue, resolve contradictions when possible, and determine what additional information or research is required to deepen the investigation or complete the work.

Writing Standards

WS 11-12.6: Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback including new arguments and information.

WS 11-12.7: Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem, narrow or broaden the inquiry when appropriate, synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

SCIENCE

Statistics and Probability- S-IC - Making Inferences and Justify Conclusions

SIC 6: Evaluate reports based on data.