Skills For All with Cisco Networking Academy

Networking Essentials 2.0.1
Scope and Sequence

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Target Audience

The Networking Essentials course is designed for high school, college, and any learner interested in developing introductory networking knowledge.

Prerequisites

There are no prerequisites for this course although learners should have a basic understanding using a laptop, smartphone, or tablet, and browsing the Internet. While it is not required, it is recommended that learners complete Introduction of Cybersecurity course.

Certification Alignment

This course, from the **Cybersecurity Pathway,** aligns with the IT Specialist Cybersecurity certification from Certiport.

Course Description

Networking Essentials teaches the fundamentals of networking. It covers how devices communicate, network addressing and network services, how to build a home network and configure basic security, the basics of configuring Cisco devices, and testing and troubleshooting network problems. The course has many features to help learners understand these concepts. The course design includes:

- Twenty modules comprised of key topics.

- Modules emphasize critical thinking, problem solving, collaboration, and the practical application of skills.

- Each module contains practice and assessment activities such as a Check Your Understanding activity, a lab, or an activity using our network simulation tool, Cisco® Packet Tracer.

- Topic-level activities are designed to indicate a learner's mastery of course skills, enabling learners to gage understanding before taking a graded quiz or exam.

- Language describing concepts is designed to be easily understood by learners at a high school level.

- Assessments and practice activities focused on specific competencies are designed to increase retention and provide flexibility in the learning path.

- Multimedia learning tools, including videos and quizzes, address a variety of learning styles, stimulating learning and promoting knowledge retention.

- Labs and Packet Tracer simulation-based activities help learners develop critical thinking and complex problem-solving skills.

- Innovative assessments provide immediate feedback to support the evaluation of knowledge and skills.

- Technical concepts are explained using introductory-level language.

- Embedded interactive activities break up reading of large content blocks and reinforce understanding.

- The course emphasizes applied skills, hands-on experience, and encourages learners to consider additional IT education.

- Packet Tracer activities are designed for use with the latest version of Packet Tracer.

Course Objectives

Networking Essentials 2.0 is designed to develop knowledge and skills needed to work in Information Technology (IT) and networking. The course material will assist you in developing learner skills, including:

- Explain the concept of network communication
- Explain the basic requirements for getting online
- Create a simulated network using Packet Tracer
- Build a simple home network
- Explain the importance of standards and protocols in network communications
- Explain how protocols enable network operations.
- Explain how communication occurs on Ethernet networks
- Create a fully connected Local Area Network (LAN)
- Explain the features of an Internet Protocol (IP) address
- Explain the Dynamic Host Configuration Protocol (DHCP) address assignment process
- Explain the principles of Internet Protocol version 4 (IPv4) and IPv6 address management
- Explain how clients access internet services
- Explain the function of common application layer services
- Configure an integrated wireless router and wireless client to securely connect to the internet
- Implement virtualization and cloud technologies
- Explain how to use security best practices to mitigate attacks.
- Configure basic network security.
- Compare in-band and out-of-band management access.
- Use the Cisco IOS
- Build a simple computer network using Cisco devices.

Equipment Requirements

The below equipment is required for the Networking Essentials:

- 1 PC running Windows 10
- A smartphone or tablet as a host device
- 1 Ethernet cable

Course Outline

Table 1 below details the modules and their associated competencies. Each module is an integrated unit of learning that consists of content, activities, and assessments that target a specific set of competencies. The size of the module depends on the depth of knowledge and skill needed to master the competency.

Table 1: Module Title and Objective

Module Title / Topic Title	Objective
Module 1: Communications in a Connected World	
1.0: Communications in a Connected World	Explain the concept of network communication.
1.1 Network Types	Explain the concept of a network
1.2 Data Transmission	Describe network data
1.3 Bandwidth and Throughput	Explain the network transmission speed and capacity.
1.4 Clients and Servers	Explain the roles of clients and servers in a network.
1.5 Network Components	Explain the roles of network infrastructure devices.
Module 2: Online Connections	
2.0: Online Connections	Explain the basic requirements for getting online.
2.1 Wireless Networks	Describe the different types of networks used by cell phones and mobile devices.
2.2 Local Network Connections	Describe the requirements for host connectivity.
2.3 Network Documentation	Explain the importance of network documentation.
Module 3: Explore Networks with Packet Tracer	
3.0 Explore Networks with Packet Tracer	Create a simulated network using Packet Tracer.
3.1 Packet Tracer Network Simulator	Describe the purpose and function of Packet Tracer.
3.2 Packet Tracer Installation	Install Packet Tracer on a local device.
3.3 The Packet Tracer User Interface	Investigate the Packet Tracer user interface.
3.4 Packet Tracer Network Configuration	Configure a Packet Tracer network.
Module 4: Build A Simple Network	
4.0 Build A Simple Network	Build a simple home network.
4.1 Network Media Types	Describe common types of network cables.
4.2 Ethernet Cabling	Describe Ethernet twisted-pair cables.
4.3 Coaxial and Fiber-Optic Cabling	Describe coaxial and fiber-optic cabling.
4.4 Twisted Pair Operation	Explain how a twisted-pair cable transmits and receives signals.

4.5 Verify Connectivity	Verify connectivity in a simple routed network.
Module 5: Communication Principles	
5.0 Communication Principles	Explain the importance of standards and protocols in network communications.
5.1 The Rules	Describe network communication protocols.
5.2 Communication Standards	Describe network communication standards.
5.3 Network Communication Models	Compare the OSI and TCP/IP models.
5.4 Ethernet	Explain the OSI model Layer 1 and Layer 2 functions in an Ethernet network.
Module 6: Network Protocols	
6.0 Network Protocols	Explain how protocols enable network operations.
6.1 Network Communications Process	Explain the basic operation of data-networked communications.
6.2 Communications Protocols	Explain how protocols enable network operations.
6.3 Data Encapsulation	Explain how data encapsulation allows data to be transported across the network.
6.4 Ethernet	Explain how Ethernet supports network communication.
6.5 IPv4	Explain how the IPv4 protocol supports network communications.
Module 7: Network Design and the Access Layer	
7.0 Network Design and the Access Layer	Explain how communication occurs on Ethernet networks.
7.1 Encapsulation and the Ethernet Frame	Explain the process of encapsulation and Ethernet framing.
7.2 Hierarchical Network Design	Explain the function at each layer of the 3-layer network design model.
7.3 The Access Layer	Explain how to improve network communication at the access layer.
7.4 Broadcast Containment	Explain why it is important to contain broadcasts within a network.
Module 8: Routing Between Networks	
8.0 Routing Between Networks	Create a fully connected LAN.
8.1 The Need for Routing	Explain the need for routing.

8.2 The Routing Table	Explain how routers use tables.
8.3 Create a LAN	Build a fully connected network.
Module 9: The Internet Protocol	
9.0 The Internet Protocol	Explain the features of an IP address.
9.1 Purpose of an IPv4 Address	Explain the purpose of an IPv4 address.
9.2 Binary Conversion of an IPv4 Address	Calculate numbers between decimal and binary systems.
9.3 The IPv4 Address Structure	Explain how IPv4 addresses and subnets are used together.
9.4 Classful IPv4 Addressing	Describe the different IPv4 address classes.
9.5 Public and Private IPv4 Addresses	Describe the public and private IPv4 address ranges.
9.6 Unicast, Broadcast, and Multicast Addresses	Compare unicast, multicast, and broadcast addresses.
Module 10: Dynamic Addressing with DHCP	
10.0 Dynamic Addressing with DHCP	Explain the DHCP address assignment process.
10.1 Static and Dynamic Addressing	Compare static and dynamic IPv4 addressing.
10.2 DHCPv4 Configuration	Configure a DHCPv4 server to dynamically assign IPv4 addresses.
Module 11: IPv6 Addressing	
11.0 IPv6 Addressing	Implement an IPv6 addressing scheme.
11.1 IPv4 Issues	Explain the need for IPv6 addressing.
11.2 IPv6 Addressing	Explain how IPv6 addresses are represented.
11.3 IPv6 Address Types	Compare types of IPv6 network addresses.
11.4 Dynamic Addressing for IPv6 GUAs	Explain how to configure global unicast addresses dynamically.
Module 12: IPv4 and IPv6 Address Management	
12.0 IPv4 and IPv6 Address Management	Explain the principles of IPv4 and IPv6 address management.
12.1 Network Boundaries	Describe network boundaries.
12.2 Network Address Translation	Explain the purpose of Network Address Translation in small networks.
12.3 IPv4 Issues	Explain why IPv6 addressing will replace IPv4 addressing.
12.4 IPv6 Features	Explain features of IPv6

Module 13. Transport Layer Services	
13.0 Transport Layer Services	Explain how clients access internet services.
13.1 The Client Server Relationship	Explain client and server interaction.
13.2 TCP and UDP	Compare TCP and UDP transport layer functions.
13.3 Port Numbers	Explain how TCP and UDP use port numbers.
Module 14. Application Layer Services	
14.0 Application Layer Services	Explain the function of common application layer services.
14.1 Network Application Services	Describe common network applications.
14.2 Domain Name System	Describe DNS.
14.3 Web Clients and Servers	Describe HTTP and HTML.
14.4 FTP Clients and Servers	Describe FTP.
14.5 Virtual Terminals	Describe Telnet and SSH.
14.6 Email and Messaging	Describe email protocols.
Module 15. Build a Home Network	
15.0. Build a Home Network	Configure an integrated wireless router and wireless client to connect securely to the internet.
15.1 Home Network Basics	Describe the components required to build a home network.
15.2 Network Technologies in the Home	Describe wired and wireless network technologies.
15.3 Wireless Standards	Describe Wi-Fi.
15.4 Mobile Device Connectivity	Configure mobile devices for wireless connectivity.
15.5 Wireless Traffic Controls	Explain how wireless traffic is controlled.
15.6 ISP Connectivity Options	Describe ISP connectivity options.
15.7 Set Up a Home Router	Configure a wireless LAN device.
Module 16: Virtualization, SDN, and Cloud-Based Services	
16.0 Virtualization, SDN, and Cloud-Based Services	Implement virtualization and cloud technologies
16.1 Network Virtualization	On a computer, configure a virtual machine that includes an operating system.
16.2 Introduction to AWS	Explain how to create a basic EC2 instance for specified requirements.

Module 17: Security Considerations	
17.0 Security Considerations	Explain how to use security best practices to mitigate attacks.
17.1 Security Threats	Describe different types of network security threats.
17.2 Social Engineering Attacks	Describe social engineering attacks.
17.3 Malware	Describe various types of malicious software.
17.4 Denial of Service	Describe denial of service attacks.
17.5 Security Tools	Explain how security tools and software updates mitigate network security threats.
17.6 Antimalware Software	Explain how antimalware software mitigates data loss and service disruptions.
Module 18. Configure Network and Device Security	
18.0 Configure Network and Device Security	Configure basic network security.
18.1 Wireless Security Measures	Describe basic ways to address wireless security vulnerabilities.
18.2 Implement Wireless Security	Configure user authentication.
18.3 Configure a Firewall	Configure firewall settings.
Module 19. Cisco Switches and Routers	
Module 19. Cisco Switches and Routers	Compare in-band and out-of-band management access.
19.1 Cisco Switches	Describe Cisco LAN switches.
19.2 Switch Boot Process	Describe the Cisco LAN switch boot process.
19.3 Cisco Routers	Describe Cisco small business routers.
19.4 Router Boot Process	Describe the Cisco router boot process.
Module 20. The Cisco IOS Command Line	
20.0 The Cisco IOS Command Line	Use the Cisco IOS.
20.1 IOS Navigation	Use the correct commands to navigate the Cisco IOS modes.
20.2 The Command Structure	Explain how to navigate the Cisco IOS to configure network devices.
20.3 View Device Information	Use show commands to monitor device operations.
Module 21: Build a Small Cisco Network	

21.0 Build a Small Cisco Network	Build a simple computer network using Cisco devices.
21.1 Basic Switch Configuration	Configure initial settings on a Cisco switch.
21.2 Configure Initial Router Settings	Configure initial settings on a router.