



Course Description

CTS1650 | CCNA 1: Cisco Fundamentals | 4.00 credits

This is the first course of the four-course Cisco curriculum that will prepare students for professional certification as a Cisco Certified Network Associate (CCNA). Students will learn networking concepts and practices, network terminology and protocols, the OSI reference model, cabling, cabling tools, routers, router and switch configurations, LAN/WAN topologies, IP addressing, and network standards.

Course Competencies:

Competency 1: The student will demonstrate an understanding of networking fundamentals by:

1. Explaining the use of binary numbers and performing binary arithmetic
2. Identifying network protocols in current use
3. Comparing and contrasting network models (e.g., peer-to-peer, client/server)
4. Comparing network operating systems
5. Describing network communications and architecture such as media, connectors, applications and protocols, network topologies
6. Comparing and contrasting the advantages and disadvantages of each topology
7. Comparing and contrasting the Open Systems Interconnection (OSI), Transmission Control Protocol (TCP), and Internet Protocol (IP) stack reference models and their layers
8. Identifying and describing current relevant IEEE network standards
9. Identifying and discussing issues related to networked environments, such as security, access control, fair use, privacy, redundancy, naming conventions for user IDs, email, passwords, and network hosts and devices
10. Describing the significant functions of LAN protocols such as Ethernet, token ring, FDDI, wireless components, standards, hardware, software, and infrastructure design
11. Describing how TCP and UDP Port addresses, IP addresses, and MAC addresses function and how they are used to deliver data across the network
12. Identifying major emerging technologies and discussing technical issues related to emerging technologies (such as security, bandwidth capability, and gigabit transmission rates)
13. Identifying the purpose and operation of DHCP and DNS in a networked environment
14. Identifying and explaining vast area network (WAN) concepts
15. Installing applications on a server and configuring clients for network access

Competency 2: The student will demonstrate an understanding of basic routing concepts by:

1. Describing the purpose, architecture, hardware, software components, and operations of a router
2. Explaining the purpose and nature of routing tables
3. Describing administrative distance and routing metrics such as hop counts, cost, etc
4. Describing how a router determines a path and switches packets
5. Differentiating between static and dynamic routing
6. Explaining the differences between class-full and classless routing
7. Describing the use and operation of variable length subnet masks (VLSM) and Classless Inter-Domain Routing (CIDR)
8. Describing how a network converges

Competency 3: The student will demonstrate an understanding of basic router configurations by:

1. Identifying the features, components, and operation of a router
2. Describing the functions, syntax, and operations of a network operating system, including the Internetwork operating system (IOS) and the command line interface (CLI)

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3. Explaining the boot up sequence of a router, including the POST, loading of the IOS, initialization of components and the loading of the startup configuration
4. Accessing a router with a console connection
5. Navigating between the various operational and configuration modes of a router
6. Configuring the router's name, passwords, remote access (telnet and SSH), banners, interfaces, routes, and other basic settings
7. Verifying, monitoring and troubleshooting router operations
8. Performing a backup of the router configurations and the IOS

Competency 4: The student will demonstrate an understanding of basic switching concepts by:

1. Identifying the layers and functions of switched network architecture
2. Describing the principles and benefits of a hierarchical network design
3. Explaining the technology and media access control method for Ethernet networks
4. Describing the issues associated with layer 2
5. Identifying and describing the key components of the Ethernet standard as applied to the design and implementation of switched networks
6. Explaining basic switching concepts and the operation of Cisco switches
7. Selecting the appropriate media, cables, ports, and connectors to connect switches to other network devices and hosts
8. Explaining the technology and media access control method for Ethernet networks

Competency 5: The student will demonstrate an understanding of basic LAN switch configurations by:

1. Identifying the features, components, and operation of a switch
2. Explaining the bootup sequence of a switch, including the POST, loading of the IOS, initialization of components, and the loading of the startup configuration
3. Accessing a switch with a console connection and navigating between the various operational and configuration modes of a switch
4. Configuring the switch's name, passwords, remote access, banners, management VLAN interface, switch ports and other settings
5. Verifying, monitoring, and troubleshooting switch operations
6. Performing a backup of the switch configuration and the IOS

Competency 6: The student will demonstrate an understanding of layered models and protocol concepts by:

1. Explaining the role of protocols in data networks
2. Describing the OSI network model and identifying the functions, addressing, and encapsulation types of each of its layers
3. Describing the TCP/IP network model and identifying the functions of each of its layers
4. Identifying the organizations that create, oversee, and amend network protocols and standards and explaining their roles
5. Explaining addressing and naming schemes at various layers of data networks
6. Identifying and inspecting the protocol data units and the encapsulation/de-capsulation process at various layers of data networks

Competency 7: The student will demonstrate an understanding of IP addressing by:

1. Describing the IP version 4 and 6 protocols and how each function
2. Describing the anatomy of IP versions 4 and 6 network address, including class, type, purpose, assignment, and subnet masks
3. Performing binary to decimal conversions, ANDing, subnetting, and Super netting
4. Determining, calculating, and assigning IP addresses for networks, subnetworks, hosts, and broadcast ranges.

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5. Describing the purpose and operation of Classless Inter-Domain Routing (CIDR) and the use of variable length subnet masks (VLSM) and network summarization
6. Calculating subnets using VLSM and CIDR notation
7. Explaining the operation and benefits of using DHCP (Dynamic Host Configuration Protocol) and DNS (Domain Name System)
8. Designing an IP addressing scheme for a CIDR network topology to fulfill given requirements

Competency 8: The student will demonstrate an understanding of Ethernet by:

1. Describing the history, development, and standardization of Ethernet technologies
2. Explaining Ethernet concepts such as media types, access, contention, services, and operation in a local area network
3. Identifying the features of Ethernet communication at the Physical and Data Link layers, including encapsulation, frame composition, MAC addressing, data transmission, and signaling
4. Explaining the process of Ethernet media access control, CSMA/CD, CSMA/CA, timing, interframe spacing, and back off in both wired and wireless networks
5. Describing bandwidth concepts and Ethernet transmission rates, signaling, and frame composition
6. Identifying the features, operation, advantages, and disadvantages of Ethernet devices, including network interface cards, transceivers, repeaters, hubs, wireless access points, bridges, and switches
7. Investigating the Address Resolution Protocol (ARP) and the mapping of MAC addresses to IP addresses
8. Describing the features, functions, and operation of wireless Ethernet

Competency 9: The student will demonstrate an understanding of network cable installation by:

1. Describing the characteristics and features of a well-designed and implemented cable network.
2. Planning and implementing a cabled network to fulfill an IP addressing scheme
3. Assembling network cables to connect end-point devices to a local area network
4. Constructing a simple Ethernet network using end-point devices, switches and routers
5. Deploying and configuring a LAN switch and a router to provide a gateway for a local area network
6. Using standard network utilities to verify small network operations and analyze data traffic

Competency 10: The student will demonstrate an understanding of basic network troubleshooting and support by:

1. Identifying, interpreting, and maintaining network documentation, procedures, and practices
2. Implementing troubleshooting strategies and techniques to resolve basic hardware, software, and network problems
3. Recognizing and resolving software configuration problems
4. Identifying and resolving common network problems at layers 1, 2, 3, and 7 using a layered model approach
5. Describing the use and features of diagnostic test equipment
6. Managing and maintaining router and switch system and configuration files

Learning Outcomes:

- Use quantitative analytical skills to evaluate and process numerical data
- Formulate strategies to locate, evaluate, and apply information
- Use computer and emerging technologies effectively