

SAN DIEGO COMMUNITY COLLEGE DISTRICT  
CONTINUING EDUCATION  
COURSE OUTLINE

**SECTION I**

**SUBJECT AREA AND COURSE NUMBER**

COMP 603

**COURSE TITLE**

WIDE AREA NETWORK DESIGN

**ALTERNATE NAME**

CISCO ACADEMY COURSE 4; WAN  
TECHNOLOGIES

**TYPE COURSE**

NON-FEE

VOCATIONAL

**CATALOG COURSE DESCRIPTION**

This course presents fundamentals in Wide Area Network Topologies, Interfaces, Protocols, Linking technology, Frame encapsulation, Design, internetworking structure and theory, ISDN and ISDN components, configuration, Frame Relay, and Subinterfaces. Students will learn through theory and hands on application, the process of designing, configuring, installing and implementing a Wide Area Network. (FT)

**LECTURE HOURS**

40

**LABORATORY HOURS**

80

**ADVISORIES**

COMP 602 or equivalent.

**RECOMMENDED SKILL LEVEL**

10th grade reading level; ability to communicate effectively in the English language; knowledge of math concepts at the 10th grade level; basic computer literacy; normal color perception and above average manual dexterity.

**INSTITUTIONAL STUDENT LEARNING OUTCOMES**

1. Social Responsibility  
SDCE students demonstrate interpersonal skills by learning and working cooperatively in a diverse environment.
2. Effective Communication  
SDCE students demonstrate effective communication skills.

INSTITUTIONAL STUDENT LEARNING OUTCOMES (CONTINUED)

3. Critical Thinking

SDCE students critically process information, make decisions, and solve problems independently or cooperatively.

4. Personal and Professional Development

SDCE students pursue short term and life-long learning goals, mastering necessary skills and using resource management and self-advocacy skills to cope with changing situations in their lives.

COURSE GOALS

Provide instruction in the practical application and theory of design, configuration, installation, implementation, access control, and troubleshooting of a Wide Area Network, ISDN, ISDN components, configuration, Frame Relay and Subinterfaces. This course will prepare the student to take certification exams like the CCNA Certification Exam (Cisco Certified Network Associate). Students will learn to show a spirit of cooperation and teamwork by completing assigned group tasks. Completion of these tasks will enhance the students' reading, writing, communication and mathematical competencies. Interpretation of technical terms used in networking and telecommunications technology, both verbal and written, is covered. Students who successfully complete this course will have completed all phases of networking training necessary to take exams like the CCNA Certification Exam.

COURSE OBJECTIVES

Upon successful completion of this course, students will demonstrate through theory and practical application, problem solving, critical thinking, written and oral communication, and mathematical ability and are able to:

1. Scaling IP and NAT/PAT configuration.
2. Demonstrate knowledge of common WAN topologies and protocols.
3. Describe WAN Design components.
4. Demonstrate knowledge of ISDN components and configuration.
5. Describe WAN Frame Encapsulation protocols.
6. Describe HDLC encapsulation.
7. Demonstrate WAN Link Technology options.
8. Demonstrate Point-to-Point Protocol.
9. Describe and demonstrate Frame Relay.
10. Describe and configure Subinterfaces.

**SECTION II**

COURSE CONTENT AND SCOPE

1. Scaling IP
  - 1.1. Configuring DHCP
  - 1.2. Configuring NAT (network address translation)
  - 1.3. Configuring PAT (port address translation)

COURSE CONTENT AND SCOPE (CONTINUED)

2. Common WAN Topologies
  - 2.1. Wide area networks and devices
  - 2.2. Overview of WAN technology
  - 2.3. Physical layer
  - 2.4. Data link layer
3. Wide Area Networking
  - 3.1. WAN services overview
  - 3.2. Interfacing with WAN service providers
  - 3.3. Subscribe to provider interface (DCE/DTE)
  - 3.4. WAN services with routers.
4. WAN Frame Encapsulation Protocols
  - 4.1. WAN encapsulation protocols
  - 4.2. WAN frame format summary
  - 4.3. Serial line encapsulation
  - 4.4. HDLC encapsulation
  - 4.5. Point-to-point protocol encapsulation
5. WAN Link Options
  - 5.1. Signaling standards and capacity
  - 5.2. Dedicated lines
  - 5.3. Leased Line connections & connectivity
  - 5.4. Technology options
  - 5.5. Multiple path
  - 5.6. Packet/cell switched connections
  - 5.7. Frame relay
  - 5.8. Circuit switched connections
  - 5.9. Dial-on-demand routing
  - 5.10. ISDN services
  - 5.11. ISDN data link encapsulation
6. WAN Design
  - 6.1. Analyze requirements
  - 6.2. Analyze network load, traffic, and application requirements
  - 6.3. Three layer model
  - 6.4. Core layer
  - 6.5. Distribution layer
  - 6.6. Access layer
  - 6.7. One layer
  - 6.8. Two layer
  - 6.9. Frame relay and ISDN WAN links
  - 6.10. Traffic patterns
7. Point-to-Point Protocol
  - 7.1. Elements
  - 7.2. Operation
  - 7.3. Frame formats
  - 7.4. Configurations
  - 7.5. Link negotiations
  - 7.6. Authentication protocol
  - 7.7. Authentication commands

COURSE CONTENT AND SCOPE (CONTINUED)

- 7.8. Verifying PPP
- 8. Overview of ISDN
  - 8.1. Remote access issues
  - 8.2. Connections
  - 8.3. Service
  - 8.4. Standards
- 9. ISDN Components
  - 9.1. Encapsulation
  - 9.2. PPP
  - 9.3. Switch types
  - 9.4. Reference points
  - 9.5. Access options
- 10. ISDN Configuration
  - 10.1. Tasks
- 11. Frame Relay
  - 11.1. Technology
  - 11.2. DLCI
  - 11.3. Format
  - 11.4. Operation
  - 11.5. ARP
  - 11.6. ISDN BRI and PRI configuration
  - 11.7. Traffic to trigger
  - 11.8. Interface Specifications
  - 11.9. Verifying ISDN operations
- 12. Subinterfaces
  - 12.1. Implementation without subinterfaces
  - 12.2. Subinterfaces
  - 12.3. Reliability issues
  - 12.4. Configurations/operation
  - 12.5. Commands
  - 12.6. Multipoint subinterfaces
  - 12.7. Point-to-point subinterfaces

APPROPRIATE READINGS

Appropriate readings may include, but are not limited to, periodicals, magazines, instructor-written materials, manuals, instructor selected URL's, and other publications related to the design of a Wide Area Network.

WRITING ASSIGNMENTS

Appropriate writing assignments may include, but are not limited to, preparing text for an assigned project, keeping a journal on all laboratory and project work, completing all assigned reports, performing mathematic calculations as assigned, and completing all written assignments.

## OUTSIDE ASSIGNMENTS

Outside assignments include, but not limited to, reading texts, reference resources or handouts, Internet sites, and research as needed to complete projects and organizing and preparing written answers to assigned questions.

## APPROPRIATE ASSIGNMENTS THAT DEMONSTRATE CRITICAL THINKING

Assignments which demonstrate critical thinking may include, but are not limited to, analysis and evaluation of reading assigned tests and eLearning materials utilizing this analysis in classroom discussions, writing assignments, and in performing laboratory activities. Students must select and use appropriate methods and materials needed to complete laboratory assignments.

## EVALUATION

A Student's grade will be based on multiple measures of performance. The assessment will measure development of independent critical thinking skills and will include evaluation of student's ability to:

1. Perform the manipulative skills of the craft, as required.
2. Apply theory to laboratory assignments.
3. Complete all eLearning lessons.
4. Successfully complete all online exams.
5. Successfully complete the online Final exam.
6. Successfully complete all assigned hands-on labs.
7. Perform on written, oral, or practical examinations.
8. Contribute to class discussions.
9. Maintain attendance per current policy.
10. Successfully complete group case study.

Satisfactory completion of the course requires completion of a culminating activity, which may include, but not limited to, one of the following:

1. Case study written report.
2. Classroom presentation.
3. Practical Lab projects, which include practical demonstrations of designing, configuring, installing and troubleshooting a Wide Area Network, WAN topologies, protocols and Link Options, ISDN components and configuration, Frame Relay, and Subinterfaces.

Upon successful completion of each individual course a Certificate of Course Completion will be issued. Upon successful completion of all courses included in the program a Certificate of Program Completion will be issued.

METHOD OF INSTRUCTION

Methods of instruction will include, but not limited to, lecture, eLearning from Cisco, self-paced lab, demonstration, individualized study, use of multimedia presentations, group/team work, tutorials, and other unique instruction requirements, such as, outside assignments, field trips, and guided student job assignments.

This course, or sections of this course, may be offered through distance education.

TEXTS AND SUPPLIES

Texts:

*Cisco Network Academy CCNA 4 Companion Guide*, current edition

URLs:

www.cisco.com  
www.cisco.netacad.com

Supplies:

USB drive or personal storage device

PREPARED BY Carol L. Akey DATE August 2, 1999

REVISED BY Don Aragon and Maria Reyes DATE February 17, 2007

REVISED BY Instructional Services/SLO's Added DATE May 30, 2013

REVISED BY Don Aragon DATE December 1, 2018

Instructors must meet all requirements stated in Policy 3100 (Student Rights, Responsibilities and Administrative Due Process), and the Attendance Policy set forth in the Continuing Education Catalog.

REFERENCES:

San Diego Community College District Policy 3100  
California Community Colleges, Title 5, Section 55002  
Continuing Education Catalog