# Course Outline

**Information and Communication Technologies** **REVISED: August/2017**

**Job Title:**
Networking Technician

**Career Pathway:**
Networking

**Industry Sector:**
Information and Communication Technologies

**O*NET-SOC CODE:**
15-1152.00

**CBEDS Title:**
Network Engineering

**CBEDS No.:**
4604

## 77-65-50

## Networking/1

**Credits:** 15 **Hours:** 180

**Course Description:**
This competency-based course is the first in a sequence of two courses designed to prepare students to pass the Cisco Certified Entry Networking Technician (CCENT) examination. Technical instruction includes an orientation, workplace safety principles and procedures, resource management, and employability skills. Emphasis is placed on data bus, memory, network storage devices, communication ports, input and output devices, communication with other computers, portable computers, hardware configuration, operating systems, introduction to computer networking, introduction to network operating systems, connecting to the network and logging in, accessing data files on the network, OSI model, IEEE networking specifications, networking architecture, network layout design, networking media, networking interface cards, network protocols, and the network operating system. 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 a 6.0 reading level as measured by the CASAS GOALS test.

**NOTE:** For Perkins purposes this course has been designated as an **introductory** course.

This course **cannot** be repeated once a student receives a Certificate of Completion.

Los Angeles Unified School District
Division of Adult and Career Education
Instructional and Couseling Services Unit
Adult Curriculum Office
www.wearedace.org

## *COURSE OUTLINE COMPETENCY-BASED COMPONENTS*

A course outline reflects the essential intent and content of the course described. Acceptable course outlines have six components. (Education Code Section 52506). Course outlines for all apportionment classes, including those in jails, state hospitals, and convalescent hospitals, contain the six required elements:

(EC 52504; 5CCR 10508 [b]; Adult Education Handbook for California [1977], Section 100)

| **COURSE OUTLINE COMPONENTS** | **LOCATION** |
|---|---|
| **GOALS AND PURPOSES** | Cover |

The educational goals or purposes of every course are clearly stated and the class periods are devoted to instruction. The course should be broad enough in scope and should have sufficient educational worth to justify the expenditure of public funds.

The goals and purpose of a course are stated in the COURSE DESCRIPTION. Course descriptions state the major emphasis and content of a course, and are written to be understandable by a prospective student.

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|---|---|
| **PERFORMANCE OBJECTIVES OR COMPETENCIES** | pp. 7-21 |

Objectives should be delineated and described in terms of measurable results for the student and include the possible ways in which the objectives contribute to the student's acquisition of skills and competencies.

Performance Objectives are sequentially listed in the COMPETENCY-BASED COMPONENTS section of the course outline. Competency Areas are units of instruction based on related competencies. Competency Statements are competency area goals that together define the framework and purpose of a course. Competencies fall on a continuum between goals and performance objectives and denote the outcome of instruction.

Competency-based instruction tells a student before instruction what skills or knowledge they will demonstrate after instruction. Competency-based education provides instruction which enables each student to attain individual goals as measured against pre-stated standards.

Competency-based instruction provides immediate and continual repetition and In competency-based education the curriculum, instruction, and assessment share common characteristics based on clearly stated competencies. Curriculum, instruction and assessment in competency-based education are: explicit, known, agreed upon, integrated, performance oriented, and adaptive.

## *COURSE OUTLINE COMPETENCY-BASED COMPONENTS (continued)*

| COURSE OUTLINE COMPONENTS | LOCATION |
|---|---|
| **INSTRUCTIONAL STRATEGIES** | p. 23 |
| Instructional techniques or methods could include laboratory techniques, lecture method, small-group discussion, grouping plans, and other strategies used in the classroom.<br><br>Instructional strategies for this course are listed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructional strategies and activities for a course should be selected so that the overall teaching approach takes into account the instructional standards of a particular program, i.e., English as a Second Language, Programs for Adults with Disabilities. | |
| **UNITS OF STUDY, WITH APPROXIMATE HOURS ALLOTTED FOR EACH UNIT** | Cover |
| The approximate time devoted to each instructional unit within the course, as well as the total hours for the course, is indicated. The time in class is consistent with the needs of the student, and the length of the class should be that it ensures the student will learn at an optimum level.<br><br>Units of study, with approximate hours allotted for each unit are listed in the COMPETENCY AREA STATEMENT(S) of the course outline. The total hours of the course, including work-based learning hours (community classroom and cooperative vocational education) is listed on the cover of every CBE course outline. Each Competency Area listed within a CBE outline is assigned hours of instruction per unit. | pp. 7-21 |
| **EVALUATION PROCEDURES** | pp. 23-24 |
| The evaluation describes measurable evaluation criteria clearly within the reach of the student. The evaluation indicates anticipated improvement in performances as well as anticipated skills and competencies to be achieved.<br><br>Evaluation procedures are detailed in the TEACHING STRATEGIES AND EVALUATION section of the course outline. Instructors monitor students' progress on a continuing basis, assessing students on attainment of objectives identified in the course outline through a variety of formal and informal tests (applied performance procedures, observations, and simulations), paper and pencil exams, and standardized tests. | |
| **REPETITION POLICY THAT PREVENTS PERPETUATION OF STUDENT ENROLLMENT** | Cover |
| After a student has completed all the objectives of the course, he or she should not be allowed to reenroll in the course. There is, therefore, a need for a statement about the conditions for possible repetition of a course to prevent perpetuation of students in a particular program for an indefinite period of time. | |

## *ACKNOWLEDGMENTS*

Thanks to GONZALO PEREZ and BRENDA VELA for developing and editing this curriculum. Acknowledgment is also given to ERICA ROSARIO for designing the original artwork for the course covers.

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**1.0 Academics**
Analyze and apply appropriate academic standards required for successful industry sector pathway completion leading to postsecondary education and employment. Refer to the Education, Child Development, and Family Services academic alignment matrix for identification of standards.

**2.0 Communications**
Acquire and accurately use Education, Child Development, and Family Services 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 Education, Child Development, and Family Services 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 Education, Child Development, and Family Services 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 Education, Child Development, and Family Services 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 Education, Child Development, and Family Services 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 as practiced in the career technical student organization (FHA-HERO, the California Affiliate of FCCLA).

**10.0 Technical Knowledge and Skills**
Apply essential technical knowledge and skills common to all pathways in the Education, Child Development, and Family Services sector, following procedures when carrying out experiments or performing technical tasks.

**11.0 Demonstration and Application**
Demonstrate and apply the knowledge and skills contained in the Education, Child Development, and Family Services anchor standards, pathway standards, and performance indicators in classroom, laboratory and workplace settings, and through the career technical student organization (FHA-HERO, the California Affiliate of FCCLA).

**B. Networking Pathway**

Students in the Networking pathway prepare for careers that involve network analysis, planning, and implementation, including the design, installation, maintenance, and management of network systems. The successful establishment, maintenance, and securing of information and communication technologies infrastructure is critical to the success of every twenty-first century organization. Employment continues to grow for persons with expertise in networking.

Sample occupations associated with this pathway:

- Computer Security Specialist
- Network Technician
- Network Engineer
- Network Administrator
- Telecommunication Specialist

B1.0 Identify and describe the principles of networking and the technologies, models, and protocols used in a network.

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.

***CBE***
***Competency-Based Education***

## *COMPETENCY-BASED COMPONENTS for the Networking/1 Course*

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| A. ORIENTATION AND SAFETY<br><br>Understand, apply, and evaluate classroom and workplace policies and procedures used in accordance with federal, state, and local safety and environmental regulations.<br><br>(5 hours) | 1. Describe the scope and purpose of the course.<br>2. Describe the overall course content as a part of the Linked Learning Initiative.<br>3. Identify classroom policies and procedures.<br>4. Describe classroom and workplace first aid and emergency procedures.<br>5. Identify the different occupations in the Information Technology Industry Sector which have an impact on the role of network technicians.<br>6. Describe the opportunities available for promoting gender equity and the representation of non-traditional populations in network communications.<br>7. Explain the impact of Environmental Protection Agency (EPA) legislation on the Information Technology Industry Sector practices.<br>8. Describe and demonstrate the procedures for contacting proper authorities for the removal of hazardous materials based on the EPA standards.<br>9. Describe and demonstrate the use of the Material Safety Data Sheet (MSDS) as it applies to network communications.<br>10. Explain the purpose of the California Occupational Safety and Health Administration (Cal/OSHA) and its laws governing network technicians.<br>11. Explain how each of the following insures a safe workplace:<br>a. employees' rights as they apply to job safety<br>b. employers' obligations as they apply to safety<br>c. safety laws applying to electrical tools<br>12. Pass the safety test with 100% accuracy. | **Career Ready Practice:**<br>1, 2, 4, 7, 8, 12<br><br>**CTE Anchor:**<br>Communications:<br>2.3, 2.4, 2.5<br>Technology:<br>4.5, 4.6<br>Health and Safety:<br>6.2, 6.3<br>Ethics and Legal Responsibilities:<br>8.2, 8.5<br>Technical Knowledge and Skills:<br>10.1, 10.2, 10.4<br>Demonstration and Application:<br>11.2<br><br>**CTE Pathway:**<br>B1.1 |
| B. RESOURCE MANAGEMENT<br><br>Understand, apply, and evaluate the basic principles of resource management used in networking technology. | 1. Define the following:<br>a. resources<br>b. management<br>c. sustainability<br>2. Describe the management of the following resources in networking technology:<br>a. time<br>b. materials | **Career Ready Practice:**<br>1, 2, 8, 12<br><br>**CTE Anchor:**<br>Communications:<br>2.4, 2.5<br>Technology:<br>4.4 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (1 hour) | c. personnel<br>3. List specific examples of effective management of the following resources in networking technology:<br>a. time<br>b. materials<br>c. personnel<br>4. Evaluate the following benefits of effective resource management in networking technology:<br>a. profitability<br>b. sustainability<br>c. company growth<br>5. Evaluate the economic benefits and liabilities of managing resources in an environmentally responsible way. | Health and Safety: 6.10<br>Responsibility and Flexibility: 7.1, 7.2, 7.4, 7.6<br>Ethics and Legal Responsibilities: 8.1, 8.5<br>Leadership and Teamwork: 9.2, 9.3<br>Technical Knowledge and Skills: 10.2<br><br>**CTE Pathway:**<br>B4.2, B4.6 |
| C. DATA BUS<br><br>Understand and evaluate microprocessors used in various types of computers.<br><br>(5 hours) | 1. Define:<br>a. data bus<br>b. PCI-X bus<br>c. PCI-Express bus<br>d. VL-bus<br>e. interface cards<br>2. Describe the function of a data bus.<br>3. Explain the architecture of a data bus.<br>4. List current bus standards.<br>5. Describe characteristics of the PCI-X bus.<br>6. Describe characteristics of the PCI-Express bus.<br>7. Describe characteristics of the VL-bus and PCI bus.<br>8. Compare different bus characteristics to determine the better performers.<br>9. Describe limitations and incompatibilities of interface cards connected to various buses.<br>10. Pass an examination of the various types of data bus. | **Career Ready Practice:**<br>1, 2, 4, 11<br><br>**CTE Anchor:**<br>Communications: 2.5, 2.7<br>Technology: 4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking: 5.4, 5.10<br>Technical Knowledge and Skills: 10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5 |
| D. MEMORY<br><br>Understand, apply, and evaluate various types of memory found in microcomputers. | 1. Define:<br>a. microcomputer memory<br>b. microcomputer storage<br>c. RAM<br>d. ROM<br>e. DIMM<br>f. virtual memory<br>g. memory module | **Career Ready Practice:**<br>1, 2, 4, 11<br><br>**CTE Anchor:**<br>Communications: 2.5, 2.7 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (5 hours) | 2. Describe the basic functions of microcomputer memory.<br>3. Explain how microcomputer memory differs from microcomputer storage.<br>4. Explain how RAM differs from ROM and identify the various types of RAM and ROM.<br>5. Identify a memory DIMM and describe the qualities that differentiate DIMMs.<br>6. Describe and demonstrate the importance of having the appropriate amount and type of memory for various configurations and applications.<br>7. Differentiate between virtual memory and RAM memory.<br>8. Identify different memory modules, such as 168 pin, 184 pin, and 240 pin.<br>9. Pass an examination identifying the various types of memory found in computers. | Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5 |
| E. NETWORK STORAGE DEVICES<br><br>Understand, apply, and evaluate the function of various types of disk and data drives. | 1. Define:<br>a. disk drive<br>b. data drive<br>c. floppy disk<br>d. flash memory<br>e. USB flash drive<br>f. write protection options<br>g. PATA<br>h. SATA<br>i. SCSI<br>j. solid state drive<br>k. magnetic drive<br>l. partitioning<br>m. IDE<br>n. CD-ROM<br>o. removable media<br>2. Describe various types of disk and data drives currently available for microcomputers.<br>3. Describe various terms used with data drives.<br>4. Explain the purpose of disks.<br>5. Describe various types of disk storage methods.<br>6. Describe the use of floppy disks.<br>7. Describe the use of flash memory in storage devices.<br>8. Identify USB flash drives.<br>9. Describe write protection options and floppy disk.<br>10. Differentiate between hard disk interfaces such as: PATA, SATA, and SCSI.<br>11. Identify solid state drives.<br>12. Differentiate between solid state drives and magnetic drives.<br>13. Describe and demonstrate how hard drive formatting works.<br>14. Describe how data is written to the hard drive.<br>15. Describe why a hard disk must be partitioned. | **Career Ready Practice:**<br>1, 2, 4, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5, B2.2, B6.3 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (10 hours) | 16. Demonstrate hard disk partitioning.<br>17. Explain how the SCSI interface is different from IDE.<br>18. Explain how a CD-ROM stores and retrieves data.<br>19. List six types or removable media.<br>20. Demonstrate how removable media is used for different applications.<br>21. Pass an examination outlining the function of the disk and data drive. | |
| F. COMMUNICATION PORTS<br><br>Understand, apply, and evaluate the communications ports on a microcomputer.<br><br>(5 hours) | 1. Define:<br>a. parallel port<br>b. crosstalk<br>c. serial port<br>d. USB port<br>e. asynchronous data frame<br>2. Describe how the parallel port transmits data.<br>3. Explain crosstalk and what can be done to avoid the problem.<br>4. Describe how the serial port transmits data.<br>5. Describe how the USB port works.<br>6. Identify the different types of USB.<br>7. Describe the bits in an asynchronous data frame.<br>8. Demonstrate attaching and detaching devices from various communications ports.<br>9. Pass an examination identifying the communications ports on a microcomputer. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.3, B2.2, B3.1 |
| G. INPUT AND OUTPUT DEVICES<br><br>Understand, apply, and evaluate the variety of devices used to input data and devices used for outputting data in a microcomputer system. | 1. Define:<br>a. pointing device<br>b. data input device<br>c. output device<br>d. page description language<br>2. Identify three pointing devices and describe how they work.<br>3. Identify three of four data input devices and describe how they work.<br>4. List four output devices.<br>5. Differentiate among various types of printers.<br>6. Explain the purpose of a page description language.<br>7. Demonstrate connecting different input and output devices for various projects.<br>8. Pass an examination identifying various input and output devices used on a microcomputer. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (5 hours) | | **CTE Pathway:**<br>B1.1, B1.3, B2.2, B3.1 |
| H. COMMUNICATION WITH OTHER COMPUTERS<br><br>Understand, apply, and evaluate the concepts of communication between computers.<br><br>(5 hours) | 1. Define:<br>a. modem<br>b. baud rate<br>c. bits per second<br>d. peer-to-peer network<br>e. client/server network<br>2. Describe how a modem is used to communicate.<br>3. Identify different standards and speeds of modems.<br>4. Explain what is meant by baud rate and how it differs from bits per second.<br>5. Describe and demonstrate how computers are attached to form a network.<br>6. Describe and demonstrate the characteristics of:<br>a. peer-to-peer network<br>b. client/server network<br>7. Differentiate between a peer-to-peer network and a client/server network.<br>8. Pass an examination identifying the different ways computers communicate. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.3, B2.2, B3.1, B3.2, B4.9, B5.2 |
| I. PORTABLE COMPUTERS<br><br>Understand and evaluate the different types of portable computer technologies.<br><br>(5 hours) | 1. Define:<br>a. notebook computer<br>b. palmtop computer<br>c. tablet computer<br>2. Describe functions and expansion capabilities of notebook computers.<br>3. Describe functions and uses of palmtop computers.<br>4. Describe functions and uses of tablet computers.<br>5. Pass an examination identifying the various types of portable computers. | **Career Ready Practice:**<br>1, 2, 4, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B2.2, B3.1, B8.5 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| J. HARDWARE CONFIGURATION<br><br>Understand, apply, and evaluate how a computer system is configured.<br><br>(5 hours) | 1. Define:<br>a. jumper<br>b. DIP switch<br>c. configure<br>d. termination<br>e. addressing<br>f. BIOS setup utility<br>g. software device driver<br>2. Describe and demonstrate how to set a jumper of DIP switches on a hardware device.<br>3. Describe the configuration options commonly set on a microcomputer.<br>4. Explain how and why hardware devices are terminated and addressed.<br>5. Describe and demonstrate how to run the BIOS setup utility to configure a PC.<br>6. Explain the purpose of a software device driver.<br>7. Pass an examination by demonstrating how to configure hardware on a computer. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B2.2, B3.1, B8.5 |
| K. OPERATING SYSTEMS<br><br>Understand, apply, and evaluate the role of operating systems.<br><br>(5 hours) | 1. Define operating system.<br>2. Describe the role of an operating system.<br>3. Identify the basic functions common to all operating systems.<br>4. List popular desktop operating systems.<br>5. Define terms related to operating system.<br>6. Pass an examination describing the role of the operating system on a computer. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.2, B4.8, B6.3 |
| L. INTRODUCTION TO COMPUTER NETWORKING<br><br>Understand, apply, and evaluate the fundamentals of computer networking. | 1. Define:<br>a. network<br>b. network components<br>c. centralized processing<br>d. distributed processing<br>e. mainframe | **Career Ready Practice:**<br>1, 2, 4, 5, 11 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| | f. client/server network<br>g. peer-to-peer network<br>2. Identify the purpose of a network.<br>3. Explain network components.<br>4. Describe the evolution of networks.<br>5. Describe and demonstrate differences between centralized processing and distributed processing.<br>6. Describe and demonstrate differences between mainframe computing and local area networks.<br>7. Describe and demonstrate differences between client/server networks and peer-to-peer networks.<br>8. Explain basic components of data communications.<br>9. Define:<br>a. network nodes<br>b. proprietary network<br>c. nonproprietary network<br>10. Describe and demonstrate the relationships among nodes on the networks.<br>11. Identify and compare classifications of networks.<br>12. Identify components of a network.<br>13. Differentiate between proprietary and nonproprietary networks.<br>14. Define various types of servers on the network.<br>15. Explain how internal server components contribute to processing efficiency.<br>16. Describe and demonstrate the application of various types of servers.<br>17. Define concepts of interpretability.<br>18. Define:<br>a. network operating system<br>b. bounded media type<br>c. unbounded media type<br>d. cable type<br>19. Analyze the purpose of a network operating system.<br>20. Compare bounded to unbounded media types.<br>21. Describe and demonstrate the use of various cable types.<br>22. Define:<br>a. network cabling segments<br>b. network backbone<br>c. network interconnecting device<br>d. network client software<br>e. network standards<br>f. cable access<br>g. topologies<br>h. local operating system<br>i. application program interfaces (APIs)<br>j. client operating system<br>23. Describe and demonstrate types of network interconnecting devices.<br>24. Define and describe the purpose of a cable access scheme.<br>25. Define the following access methods: | **CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5, B3.2, B4.9, B6.2 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| | a. CSMA/CD<br>b. token passing<br>26. Compare the network operating system software to the network client software.<br>27. Define the components of data communications.<br>28. Identify and explain network standards.<br>29. Define and explain the purpose of a standards committee.<br>30. Explain various types of data transmission.<br>31. Compare cable access methods.<br>32. List types of topologies.<br>33. Describe the type of software used for networking.<br>34. Differentiate between network and local operating system.<br>35. Explain the purpose of APIs.<br>36. Distinguish among types of software interfaces.<br>37. Identify software common to client operating systems.<br>38. Combine software services with the network services, often incorporated as part of the network operating system.<br>39. Define:<br>a. virus<br>b. worm<br>40. Explain the effect of the following:<br>a. a virus on a computer<br>b. a worm on a network<br>41. Define software piracy.<br>42. Explain the consequences of practicing software piracy.<br>43. Define:<br>a. cabling technology<br>b. ISDN<br>c. ATM<br>d. Wi-Fi<br>e. WiMAX<br>f. Mobile Computing<br>g. multimedia<br>h. cable modem<br>i. DOCSIS standard<br>j. PCMCIA<br>k. SONET<br>l. DSL<br>44. Evaluate the future of cabling technologies.<br>45. Identify ISDN's impact today and into the future.<br>46. Identify options offered by ATMs.<br>47. Evaluate Emerging Operating Systems and Desktop Interfaces.<br>48. Analyze new tools and standards for Network Management.<br>49. Explain Wi-FI and demonstrate its use in today's network.<br>50. Explain wireless encryption.<br>51. Describe the emergence of WiMAX.<br>52. Identify Mobile Computing.<br>53. Explain multimedia network emerging technologies for networks.<br>54. Explain cable modems and the DOCSIS standards.<br>55. Define trends for Portable Computing and PCMCIA for the future. | |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (25 hours) | 56. Explain the emergence of SONET.<br>57. Describe DSL and related components.<br>58. Define the following:<br>a. voice over internet protocol (VoIP)<br>b. H.323 protocol<br>c. Private Branch Exchange (PBX) system<br>d. IP telephone<br>59. Explain the importance of IP networks to telecommunications.<br>60. Explain the importance of the H.323 protocol.<br>61. Identify the purpose of a VoIP gateway.<br>62. Describe and demonstrate the three types of connectivity that can be implemented for VoIP telephony.<br>63. Describe and demonstrate how to set up a PBX system.<br>64. Describe and demonstrate how to set up an IP telephone.<br>65. Identify Network Development Tools.<br>66. Explain Neural Networks and indicate likely future fuzzy logic applications.<br>67. Pass an examination outlining the fundamentals of computer networking. | |
| M. INTRODUCTION TO NETWORK OPERATING SYSTEMS<br><br>Understand, apply, and evaluate the use of NetWare on the network.<br><br>(5 hours) | 1. Define:<br>a. network administrator<br>b. NetWare<br>c. leaf object<br>d. container object<br>2. List several responsibilities of a network administrator.<br>3. List NetWare network services.<br>4. Explain leaf and container objects.<br>5. Demonstrate correct object-naming techniques.<br>6. Identify the major network operating systems, including Novell Netware, Unix, and Windows 2000/2003/2008 server.<br>7. Pass an examination identifying the various network operating systems on the market. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5, B4.9, B6.1 |
| N. CONNECTING TO THE NETWORK AND LOGGING IN<br><br>Understand, apply, and evaluate how to access the network from a workstation. | 1. Define:<br>a. workstation<br>b. LAN<br>2. Perform workstation to LAN boot sequence.<br>3. Identify physical and logical sequences involved in the workstation to LAN boot sequence. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (5 hours) | 4. Explain the process and files necessary to boot the workstation locally.<br>5. Identify files involved on the workstation to configure the network connection.<br>6. Describe the essential network configuration file components.<br>7. Explain how to configure the workstation to boot.<br>8. Describe how a workstation communicates with the network, and list the files required to connect a workstation to the network.<br>9. Describe the function of the software and hardware, including local operating systems, communications protocols, and network boards necessary to connect a workstation to the network.<br>10. Explain and perform the login procedure.<br>11. Pass an examination explaining steps used to connect and login to a network. | **CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.4, 5.10<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5, B4.9, B6.1 |
| O. ACCESSING DATA FILES AND APPLICATIONS ON THE NETWORK<br><br>Understand, apply, and evaluate how to access data files and applications on the network.<br><br>(5 hours) | 1. Define:<br>a. volume<br>b. directory structure<br>c. network drive<br>d. search drive<br>2. Explain basic components of network file storage, including volumes, directory structures, network drives, and search drives.<br>3. Demonstrate volume, directory, and file information.<br>4. Explain how to map a network drive.<br>5. Explain how to disconnect a network drive.<br><br>6. Pass an examination explaining steps used to access data files and applications on a network. | **Career Ready Practice:**<br>1, 2, 4, 10<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.5, B4.9, B6.1 |
| P. OSI MODEL<br><br>Understand and evaluate the open systems interconnection (OSI) and how it affects a network. | 1. Define open systems interconnection (OSI).<br>2. Identify and explain the following layers of the OSI model and their relationship to networking hardware and software:<br>a. application layer<br>b. presentation layer<br>c. session layer<br>d. transport layer<br>e. network layer<br>f. data Link layer | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (10 hours) | g. physical layer<br>3. Pass a quiz covering the layers of the OSI model. | Problem Solving and Critical Thinking: 5.3, 5.4<br>Technical Knowledge and Skills: 10.1<br><br>**CTE Pathway:** B1.1, B1.2, B1.5, B4.9, B6.1 |
| Q. IEEE NETWORKING SPECIFICATIONS<br><br>Understand and evaluate the Institute of Electrical and Electronic Engineers (IEEE) 802 networking model and related standards.<br><br>(10 hours) | 1. Define:<br>a. Institute of Electrical and Electronic Engineers (IEEE)<br>b. IEEE standard<br>c. Logical Link Control<br>d. token bus<br>e. token ring<br>f. metropolitan area network (MAN)<br>g. wireless network<br>2. Explain IEEE 802.2 for Logical Link Control.<br>3. Explain IEEE 802.3 for CSMA/CD (Ethernet).<br>4. Explain IEEE 802.4 for token bus.<br>5. Explain IEEE 802.5 for token ring.<br>6. Explain IEEE 802.6 for metropolitan area networks (MAN).<br>7. Explain IEEE 802.11 for wireless networks.<br>8. Pass an examination identifying various IEEE standards. | **Career Ready Practice:** 1, 2, 4, 10<br><br>**CTE Anchor:** Communications: 2.5, 2.7<br>Technology: 4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking: 5.3, 5.4<br>Technical Knowledge and Skills: 10.1<br><br>**CTE Pathway:** B1.1, B1.2, B1.4 |
| R. NETWORKING ARCHITECTURE<br><br>Understand and evaluate the different types of Network Architecture. | 1. Define:<br>a. Ethernet<br>b. Power over Ethernet (PoE)<br>c. Attached Resource Computer (ARC)<br>d. Fiber Distributed Data Interface (FDDI)<br>e. broadband technologies<br>f. broadcast technologies<br>g. gigabit technologies<br>2. Identify an Ethernet network.<br>3. Identify a token ring network.<br>4. Identify a PoE (Power over Ethernet) and ARCnet (Attached Resource Computer) network.<br>5. Identify a FDDI (Fiber Distributed Data Interface) network.<br>6. Identify a broadband technologies network. | **Career Ready Practice:** 1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:** Communications: 2.5, 2.7<br>Technology: 4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking: 5.3, 5.4 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (10 hours) | 7. Explain a broadcast technologies network structure.<br>8. Describe a gigabit technologies network.<br>9. Explain how to decide the architecture that will best fit your network selection.<br>10. Pass an examination of network architectures. | Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4 |
| S. NETWORK LAYOUT DESIGN<br><br>Understand, apply, and evaluate the design several types of network architecture.<br><br>(10 hours) | 1. Define:<br>a. networking topology<br>b. star<br>c. ring mesh<br>d. star-bus<br>e. star-ring<br>f. Wide-Area Network (WAN)<br>g. Server-Based network<br>h. Hybrid network<br>2. Explain the various networking topologies including bus, star, ring mesh, star-bus, star-ring, and how they will work in a network structure.<br>3. Identify a Local Area Network (LAN); develop a sample LAN.<br>4. Identify a Wide Area Network (WAN); develop a sample WAN.<br>5. Identify a Metropolitan Area Network (MAN); develop a sample MAN.<br>6. Describe a Peer-to-Peer network.<br>7. Describe a Server-Based network.<br>8. Describe a Hybrid network.<br>9. Identify and explain server hardware requirements.<br>10. Describe the different specialized servers available and how they are used in network.<br>11. Prepare various samples of a network topology for review. | **Career Ready Practice:**<br>1, 2, 4, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4, B2.1, B2.2 |
| T. NETWORKING MEDIA<br><br>Understand, apply, and evaluate the various networking cables and connectors and how they should be used in a network. | 1. Define the following types of cables:<br>a. coax<br>b. thin coax<br>c. thick coax<br>d. twister-pair<br>e. shielded twisted-pair<br>f. unshielded twisted-pair<br>g. fiber optic<br>2. Identify thin and thick coax, twister-pair, shielded twisted-pair, unshielded twisted-pair, and fiber optic cables.<br>3. Describe the advantage and disadvantages of the different cables.<br>4. Identify the various cable connectors.<br>5. Prepare different kinds of cables. | **Career Ready Practice:**<br>1, 2, 4, 5, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (10 hours) | 6. Test different kinds of cables using modern cable testing equipment.<br>7. Explain when to use a particular kind of cable.<br>8. Prepare various network cable samples for review. | Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4, B2.1, B2.2 |
| U. NETWORKING INTERFACE CARDS<br><br>Understand, apply, and evaluate the different types of network cards used to make a network connection.<br><br>(5 hours) | 1. Identify and explain what a network interface card (NIC) is and how to install one into a computer.<br>2. Identify special purpose NICs.<br>3. How to choose the correct NIC for the type of network being setup.<br>4. Install software drivers for a NIC.<br>5. Pass an examination identifying the parts of network cards. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4, B2.1, B2.2 |
| V. NETWORK PROTOCOLS<br><br>Understand and evaluate the different communication options in a network structure. | 1. Define:<br>a. packets<br>b. IP default gateway<br>c. routable protocol<br>d. non-routable protocol<br>e. Transmission Control Protocol/Internet Protocol (TCP/IP)<br>f. subnet mask number<br>g. BIG-IP v10<br>2. Explain how network operating systems work.<br>3. Analyze the function of packets in a network.<br>4. Explain how to implement and remove network protocols.<br>5. Explain the importance of choosing the correct protocols for a network. | **Career Ready Practice:**<br>1, 2, 4, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (10 hours) | 6. Explain the concept of IP default gateways.<br>7. Explain the difference between routable and non-routable protocols.<br>8. Explain TCP/IP (Transmission Control Protocol/Internet Protocol) addressing classes A, B, and C.<br>9. Identify the default subnet mask numbers.<br>10. Explain the importance of BIG-IP v10 to data delivery.<br>11. Pass an examination of network protocols and their uses. | Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4, B2.1, B2.2 |
| W. NETWORK OPERATING SYSTEM<br><br>Understand, apply, and evaluate the different network operating systems (NOS).<br><br>(15 hours) | 1. Explain how network operating systems (NOS) work.<br>2. Understand the various networking software components.<br>3. Install a network operation system.<br>4. Define and implement network services.<br>5. Install and configure network applications.<br>6. Pass an examination utilizing the techniques used to install NOS. | **Career Ready Practice:**<br>1, 2, 4, 5, 10, 11<br><br>**CTE Anchor:**<br>Communications:<br>2.5, 2.7<br>Technology:<br>4.1, 4.2, 4.6<br>Problem Solving and Critical Thinking:<br>5.3, 5.4<br>Technical Knowledge and Skills:<br>10.1<br><br>**CTE Pathway:**<br>B1.1, B1.2, B1.4, B2.1, B2.2 |
| X. EMPLOYABILITY SKILLS<br><br>Understand, apply, and evaluate employability skills required in networking. | 1. Summarize employer requirements for the following:<br>a. punctuality<br>b. attendance<br>c. attitude toward work<br>d. quality of work<br>e. teamwork<br>f. responsibility<br>g. timeliness<br>h. communication skills<br>2. Create a career plan that builds on existing interests, skills, and abilities.<br>3. Explain the importance of the continuous upgrading of job skills through lifelong learning. | **Career Ready Practice:**<br>1, 2, 3, 4, 7, 8, 10, 11, 12<br><br>**CTE Anchor:**<br>Communications:<br>2.2, 2.4, 2.5, 2.7<br>Career Planning and Management:<br>3.1, 3.3, 3.6, 3.8<br>Technology:<br>4.1, 4.2, 4.4, 4.6 |

| COMPETENCY AREAS AND STATEMENTS | MINIMAL COMPETENCIES | STANDARDS |
|---|---|---|
| (4 hours) | 4. Identify pre-professional and professional industry organizations and describe the employability benefits of belonging.<br>5. State the need to adapt to varied roles and responsibilities in the workplace.<br>6. Identify conflict resolution strategies for a variety of workplace situations.<br>7. Describe ways to demonstrate respect for individual and cultural differences and for the attitudes and feelings of others.<br>8. Describe customer service as a method of building permanent relationships between the organization and the customer.<br>9. Describe the role of electronic social networking in job search.<br>10. Design sample résumés and cover letters.<br>11. Explain the importance of filling out a job application legibly, with accurate and complete information.<br>12. Describe the common mistakes that are made on job applications.<br>13. Complete sample job application forms correctly.<br>14. State the importance of enthusiasm in the interview and on a job.<br>15. State the importance of appropriate appearance in the interview and on a job.<br>16. Describe and demonstrate appropriate interviewing techniques.<br>17. Identify the informational materials, resources, and test knowledge needed to be successful in an interview.<br>18. Design sample follow-up letters.<br>19. Demonstrate appropriate follow-up procedures. | Problem Solving and Critical Thinking: 5.3, 5.4<br>Responsibility and Flexibility: 7.2, 7.3, 7.4, 7.7<br>Ethics and Legal Responsibilities: 8.3, 8.4<br>Leadership and Teamwork: 9.2, 9.3, 9.7<br><br>**CTE Pathway:** B1.1 |

## *SUGGESTED INSTRUCTIONAL MATERIALS and OTHER RESOURCES*

**TEXTBOOKS**

Keitner, JoAnne. Networking Fundamentals: Study Guide (2nd ed.). Goodheart-Willcox Co., 2012.

Reid, Allan, and Jim Lorenz. Networking for Home and Small Businesses: CCNA Discovery Learning Guide. Cisco Press, 2008.

Reid, Allen, and Jim Lorenzo. Working at a Small to Medium Business or ISP CCNA Discovery Learning Guide. Cisco Press, 2008.

Roberts, Richard M. Networking Fundamentals . (2nd ed). Goodheart-Willcox Co., 2011.

Roberts, Richards. Laboratory Manual Networking Fundamentals (2nd ed). Goodheart-Willcox Company, 2011. Print.

**RESOURCES**

Employer Advisory Board members

**CTE MODEL CURRICULUM STANDARDS**
**Fashion and Interior Design Industry Sector**
http://www.cde.ca.gov/ci/ct/sf/documents/edchildfamily.pdf

CISCO Systems http://www.cisco.com/

CompTIA http://www.comptia.org/home.aspx

Institute of Electrical and Electronics Engineers (IEEE) http://www.ieee.org/index.html

IEEE Communications Society http://www.comsoc.org/

**COMPETENCY CHECKLIST**

## *TEACHING STRATEGIES and EVALUATION*

**METHODS AND PROCEDURES**

A. Lecture and discussion

B. Demonstrations and participation

C. Multimedia presentations

D. Individualized instruction

E. Role-playing

F. Guest speakers

G. Field trips and field study experiences

H. Projects

**EVALUATION**

SECTION A – Orientation and Safety – Pass the safety test with 100% accuracy.

SECTION B – Resource Management – Pass all assignments and exams on resource management with a minimum score of 80% or higher.

SECTION C – Data Bus – Pass all assignments and exams on data bus with a minimum score of 80% or higher.

SECTION D – Memory – Pass all assignments and exams on memory with a minimum score of 80% or higher.

SECTION E – Network Storage Devices – Pass all assignments and exams on network storage devices with a minimum score of 80% or higher.

SECTION F – Communication Ports – Pass all assignments and exams on communication ports with a minimum score of 80% or higher.

SECTION G – Input and Output Devices – Pass all assignments and exams on input and output devices with a minimum score of 80% or higher.

SECTION H – Communication with Other Computers – Pass all assignments and exams on communication with other computers with a minimum score of 80% or higher.

SECTION I – Portable Computers – Pass all assignments and exams on portable computers with a minimum score of 80% or higher.

SECTION J – Hardware Configuration – Pass all assignments and exams on hardware configuration with a minimum score of 80% or higher.

SECTION K – Operating Systems – Pass all assignments and exams on operating systems with a minimum score of 80% or higher.

SECTION L – Introduction to Computer Networking – Pass all assignments and exams on introduction to computer networking with a minimum score of 80% or higher.

SECTION M – Introduction to Network Operating Systems – Pass all assignments and exams on introduction to network operating systems with a minimum score of 80% or higher.

SECTION N – Connecting to the Network and Logging In – Pass all assignments and exams on connecting to the network and logging in with a minimum score of 80% or higher.

SECTION O – Accessing Data Files and Applications on the Network – Pass all assignments and exams on accessing data files on the network with a minimum score of 80% or higher.

SECTION P – OSI Model – Pass all assignments and exams on OSI model with a minimum score of 80% or higher.

SECTION Q – IEEE Networking Specifications – Pass all assignments and exams on IEEE networking specifications with a minimum score of 80% or higher.

SECTION R – Networking Architecture – Pass all assignments and exams on networking architecture with a minimum score of 80% or higher.

SECTION S – Network Layout Design – Pass all assignments and exams on network layout design with a minimum score of 80% or higher.

SECTION T – Networking Media – Pass all assignments and exams on networking media with a minimum score of 80% or higher.

SECTION U – Networking Interface Cards – Pass all assignments and exams on networking interface cards with a minimum score of 80% or higher.

SECTION V – Network Protocols – Pass all assignments and exams on network protocols with a minimum score of 80% or higher.

SECTION W – Network Operating System– Pass all assignments and exams on network operating system with a minimum score of 80% or higher.

SECTION X – Employability Skills – Pass all assignments and exams on employability skills with a minimum score of 80% or higher.

## Statement for Civil Rights

All educational and vocational opportunities are offered without regard to race, color, national origin, gender, or physical disability.