

Florida Department of Education  
CURRICULUM FRAMEWORK

**Program Title:** Network Support Services  
**Program Type:** Job Preparatory  
**Occupational Area:** Business Technology Education  
**Components:** Five Occupational Completion Points Including Core

	<u>Secondary</u>	<u>PSAV</u>
<b>Program Number:</b>	<b>8208000</b>	<b>B078000</b>
CIP Number:	0507.030402	0507.030402
Grade Level:	9-12, 30, 31	30, 31
Standard Length:	7 credits	1050 hours
Certification:	BUS ED @4 1 @2 VOE @7 TEACH CBE @7 TEC ELEC \$7 G BUS DP @7 G ELECT DP @7 G BOOKKEEPIN @4 7 G CLERICAL @7 G SECRETAR @7 G	BUS ED @4 1 @2 VOE @7 TEACH CBE @7 TEC ELEC \$7 G BUS DP @7 G ELECT DP @7 G BOOKKEEPIN @4 @7 G CLERICAL @7 G SECRETAR @7 G
[Intro to IT, OCP B, C, D, and E only]		
Additional certification accepted:	COMP SCI @6 @2 ANY ACADEMIC FIELD + appropriate industry certification District vocational certificate + appropriate industry certification	COMP SCI @6 @2 ANY ACADEMIC FIELD + appropriate industry certification District vocational certificate + appropriate industry certification
CSO:	FBLA BPA	Phi Beta Lambda BPA
Coop Method:	Yes	Yes
Apprenticeship:	No	No
Facility Code:	212	212
Basic Skills:		
Math		9
Language		9
Reading		9
SOC Code:		

I. **PURPOSE:** This program is designed to prepare students for employment as an Information Technology Assistant, Computer Support Assistant, Network Support Assistant, Network Administrator, Wireless Network Administrator, and Data Communications Analyst.

This program offers a broad foundation of knowledge and skills to prepare students for employment in network support services positions. The content includes instruction in computer literacy; software application support; basic hardware configuration and troubleshooting; networking technologies, troubleshooting, security, and administration; and customer service and human relations skills.

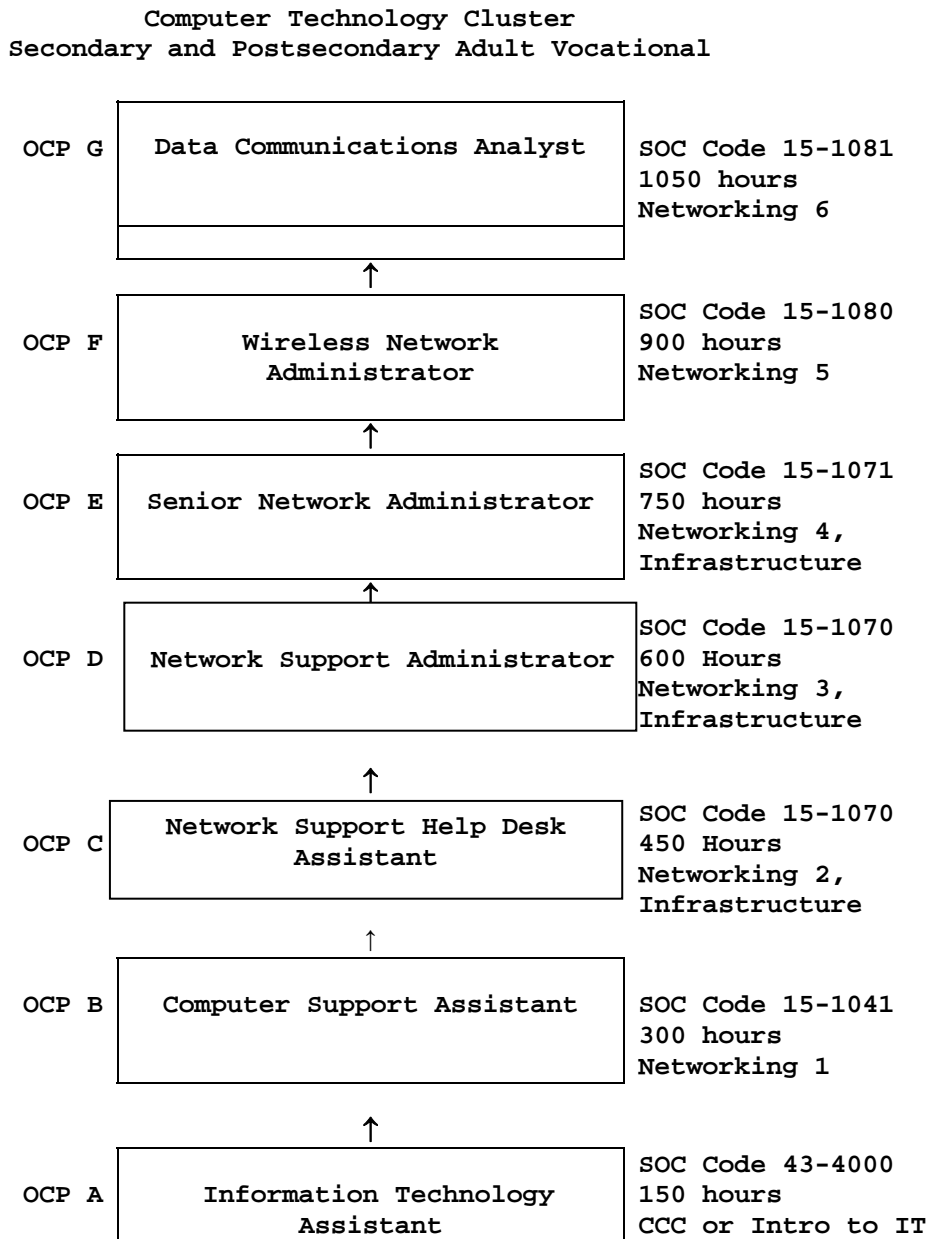
This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the network support services industry: planning; management; finance; technical and production skills; underlying principles of technology;

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labor issues; community issues; and health, safety, and environmental issues.

- II. **PROGRAM STRUCTURE:** This program is a planned sequence of instruction consisting of the Business Information Technology Education Core - Computing for College and Careers 1 or Introduction to Information Technology (Information Technology Assistant - OCP A) and six additional occupational completion points. Secondary or postsecondary students who have previously completed the Business Information Technology Education Core will not have to repeat the core. A student who completes the applicable competencies at any occupational completion point may either continue with the training program or exit as an occupational completer.

The following diagram illustrates the Network Support Services program structure:



## Network Support Services



When offered at the secondary level, this program consists of the following courses which include the Business Technology Education Core:

Business Technology Education Core  
8209020 - Computing for College and Careers  
OR  
8207310 - Introduction to Information Technology  
8207020 - Networking 1  
8207030 - Networking 2, Infrastructure  
8207040 - Networking 3, Infrastructure  
8207050 - Networking 4, Infrastructure  
8207060 - Networking 5  
8207070 - Networking 6

- III. **LABORATORY ACTIVITIES:** Laboratory activities are an integral part of this program and include the use of keyboarding systems, computers, file servers, network transmission media, network cards, and other peripheral devices. Students will also work with operating systems, network operating systems, and applications software.
- IV. **SPECIAL NOTES:** Future Business Leaders of America (Secondary), Phi Beta Lambda (Postsecondary), and Business Professionals of America are the appropriate Career Student Organizations (CSO) for providing leadership training and for reinforcing specific career and technical skills. Career Student Organizations, when provided, shall be an integral part of the career and technical instructional program, and the activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, FAC.

Cooperative training - OJT is appropriate for this program. Whenever cooperative training - OJT is offered, the following are required for each student: a training plan, signed by the student, teacher, and employer, which includes instructional objectives and a list of on-the-job and in-school learning experiences; a workstation that reflects equipment, skills, and tasks that are relevant to the occupation which the student has chosen as a career goal. The student must receive compensation for work performed.

In accordance with Rule 6A-10.040, FAC., the minimum basic skills grade levels required for postsecondary adult vocational students is: Mathematics 9.0, Language 9.0, Reading 9.0. These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

This program may be offered in courses. Vocational credit shall be awarded to the student on a transcript in accordance with Section 230.643 F.S.

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Adult students with disabilities must self-identify and request such services. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules learning environment, assistive technology and special communication systems.

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Documentation of the accommodations requested and provided should be maintained in a confidential file.

The standard length of this program is 1050 hours.

To be transferable statewide between institutions, this program must have been reviewed, and a "transfer value" assigned the curriculum content by the appropriate Statewide Course Numbering System discipline committee. This does not preclude institutions from developing specific program or course articulation agreements with each other.

The particular outcomes and student performance standards which the handicapped student must master to earn credit must be specified in the student's individual educational plan (IEP). Additional credits may be earned when outcomes and standards are mastered in accordance with the requirements indicated in subsequent IEPs. The job title for which the student is being trained must be designated in the IEP.

**Soft Skills/Employability Skills:** Industry representatives have recommended that the following basic/required soft skills be incorporated in the instructional strategies for this program-active listening; industry knowledge; behavior flexibility; decision making; oral communication and presentation; organizing and planning; problem solving; written communication; teamwork; interviewing/employability skills.

**SCANS Competencies:** Instructional strategies for this program must include methods that require students to identify, organize, and use resources appropriately; to work with each other cooperatively and productively; to acquire and use information; to understand social, organizational, and technological systems; and to work with a variety of tools and equipment. Instructional strategies must also incorporate the methods to improve students' personal qualities and high-order thinking skills.

**21<sup>st</sup>-Century Skills:** Instructional strategies for this program must include methods that require students to acquire 1. Digital-Age Literacy - basic scientific, mathematical, and technological literacies - visual and information literacies - cultural literacy and global awareness; 2. Inventive Thinking - adaptability/ability to manage complexity - curiosity, creativity, and risk taking - higher order thinking and sound reasoning; 3. Effective Communication - teaming, collaboration, and interpersonal skills - personal and social responsibility - interactive communication; 4. High Productivity - ability to prioritize, plan, and manage for results - effective use of real-world tools - relevant, high-quality products.

**Equipment List:** A generic equipment list is available for this program.

- V. **DISTANCE LEARNING:** Effective distance learning in technical degree programs is sometimes difficult to accomplish due to the need for student participation in skills activities as part of the curriculum. However there are distance learning tools that offer a variety of courses that utilize both synchronous and asynchronous to allow interaction with instructors, fellow students and practicing professionals. Many textbook publishers are now offering e-packs that coordinate with the text, and offer a variety of web-enhanced activities. Instructors have noticed increased

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success rates, as measured by percentage of students completing the course with a passing grade, when using materials integrated with the same text as used in traditional courses. The courses most adaptable to this type of format at the present time seem to be those dealing with computer literacy and computer applications. Other features of quality distance learning products include:

- Industry Standard curriculum that can lead to certification
- Pre-assessment components
- Assessment tools
- Media environments

VI. **INTENDED OUTCOMES:** After completing the following competencies, the student will be able to:

### OCCUPATIONAL COMPLETION POINT - DATA CODE A

INFORMATION TECHNOLOGY ASSISTANT - SOC Code 43-4000

Computing for College and Careers competencies:

- 01.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 01.01, 01.02, 01.03, 01.04, 01.05, 01.06, 01.07, 01.08.]
- 02.0 Demonstrate comprehension and communication skills. [Student Performance Standards: 02.01, 02.02, 02.04, 02.05, 02.06, 02.07.]
- 03.0 Use technology to apply and enhance communication skills in technical reading, writing. [Student Performance Standards: 03.01, 03.02, 03.03, 03.05, 03.06.]
- 04.0 Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/employee roles. Demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member. [Student Performance Standards: 04.01, 04.02, 04.03.]
- 05.0 Practice quality performance in the learning environment and the workplace. [Student Performance Standards: 05.01, 05.02.]
- 06.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal and professional ethics to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 06.01, 06.02, 06.03.]
- 07.0 Apply mathematical operations and processes as well as financial planning strategies to commonly occurring situations in the workplace to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 07.01, 07.02, 07.03.]
- 08.0 Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal development, and life goals. [Student Performance Standards: 08.01, 08.02, 08.03.]
- 09.0 Incorporate knowledge gained from individual assessment and job/career exploration to design an individual career plan that reflects the transition from school to work, lifelong learning, and personal and professional goals. Experience work-based learning through job shadowing, mentoring, e-coaching, etc. [Student Performance Standards: 09.01, 09.02, 09.03, 09.04, 09.05, 09.06, 09.07, 09.08.]

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- 10.0 Demonstrate personal and interpersonal skills and attributes appropriate for the workplace. [Student Performance Standards: 10.01, 10.02, 10.03.]
- 13.0 Perform office functions and responsibilities to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 13.02.]
- 41.0 Perform e-mail activities. [Student Performance Standards: 41.01, 41.09.]
- 42.0 Demonstrate operating systems. [Student Performance Standards: 42.01, 42.10, 42.12, 42.14.]
- 67.0 Develop an awareness of emerging technologies. [Student Performance Standards: 67.01, 67.02, 67.03.]

OR

## Introduction to IT Competencies:

- 01.0 Demonstrate knowledge, skill, and application of information systems to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 01.01, 01.02, 01.03, 01.04, 01.06, 01.07.]
- 02.0 Demonstrate Comprehension and communication skills. [Student Performance Standards: 02.03, 02.62, 02.63, 02.64, 02.65, 02.66.]
- 03.0 Use technology to enhance the effectiveness of communication skills. [Student Performance Standards: 03.03, 03.06.]
- 04.0 Develop an awareness of management functions and organizational structures as they relate to today's workplace and employer/employee roles. [Student Performance Standards: 04.01, 04.02.]
- 05.0 Practice quality performance in the learning environment and the workplace. [Student Performance Standards: 05.01, 05.02.]
- 06.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 06.03.]
- 07.0 Apply mathematical operations and processes as well as financial planning strategies to commonly occurring situations in the workplace to accomplish job objectives and enhance workplace performance. [Student Performance Standards: 07.01, 07.02, 07.03.]
- 08.0 Assess personal strengths and weaknesses as they relate to job objectives, career exploration, personal development, and life goals. [Student Performance Standards: 08.02, 08.03.]
- 09.0 Incorporate knowledge gained from individual assessment and job/career exploration to design an individual career plan that reflects the transition from school to work, lifelong learning, and personal and professional goals. [Student Performance Standards: 09.15, 09.16, 09.17, 09.18, 09.19, 09.20.]
- 10.0 Demonstrate human relations/interpersonal skills appropriate for the workplace. [Student Performance Standards: 10.01, 10.03.]
- 20.0 Participate in work-based learning experiences. [Student Performance Standards: 20.44, 20.46.]
- 41.0 Perform e-mail activities. [Student Performance Standards: 41.01, 41.02, 41.03, 41.04, 41.05, 41.06, 41.07, 41.08, 41.09, 41.10, 41.11, 41.12, 41.13.]
- 42.0 Demonstrate knowledge of different operating systems. [Student Performance Standards: 42.01, 42.10, 42.12, 42.14.]

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- 55.0 Demonstrate proficiency navigating the internet, intranet, and the WWW. [Student Performance Standards: 55.01, 55.10, 55.11, 55.14, 55.15, 55.16, 55.17, 55.18.]
- 56.0 Demonstrate proficiency using HTML commands. [Student Performance Standards: 56.01, 56.02, 56.03, 56.04, 56.05, 56.06, 56.08, 56.17, 56.18, 56.19.]
- 57.0 Demonstrate proficiency in page design applicable to the WWW. [Student Performance Standards: 57.01, 57.02, 57.04, 57.05, 57.25, 57.26, 57.27.]
- 63.0 Demonstrate proficiency using specialized web design software. [Student Performance Standards: 63.01, 63.02.]
- 64.0 Develop an awareness of the information technology industry. [Student Performance Standards: 64.01, 64.04, 64.05.]
- 65.0 Develop an awareness of microprocessors and digital computers. [Student Performance Standards: 65.01, 65.02, 65.03, 65.04, 65.05, 65.06, 65.07, 65.08.]
- 66.0 Develop an awareness of programming languages. [Student Performance Standards: 66.01, 66.02, 66.03, 66.04.]
- 67.0 Develop an awareness of emerging technologies. [Student Performance Standards: 67.01, 67.02, 67.03.]
- 69.0 Demonstrate an understanding of the seven layers of the Open Systems Interface (OSI) model. [Student Performance Standards: 69.01, 69.02, 69.04, 69.06, 69.07, 69.08, 69.09, 69.11.]
- 70.0 Demonstrate proficiency using common software applications. [Student Performance Standards: 70.01, 70.02.]
- 71.0 Demonstrate proficiency using specialized software applications. [Student Performance Standards: 71.01, 71.02, 71.06.]

## OCCUPATIONAL COMPLETION POINT - DATA CODE B

COMPUTER SUPPORT ASSISTANT - SOC Code 15-1041

Intended outcomes of OCP A must be completed previously or concurrently. After completing the following additional competencies, the student will have achieved the occupational completion point of Computer Support Specialist and the student will be able to:

- 08.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. [Student Performance Standard: 08.17.]
- 30.0 Identify, install, configure, and upgrade desktop and server computer modules and peripherals, following established basic procedures for system assembly and disassembly of field replaceable modules. [Student Performance Standards: 30.01, 30.02, 30.03, 30.04, 30.05, 30.06, 30.07, 30.08, 30.09, 30.10, 30.11, 30.12, 30.13, 30.14, 30.15.]
- 31.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. [Student Performance Standards: 31.01, 31.02, 31.03, 31.04, 31.05, 31.06, 31.07, 31.08, 31.09.]
- 32.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. [Student Performance Standards: 32.01, 32.02, 32.03, 32.04, 32.05.]
- 33.0 Identify specific terminology, facts, ways and means of dealing with classifications, categories and principles of motherboards, processors and memory in desktop and server computer systems. [Student Performance Standards: 33.01, 33.02, 33.03.]

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- 34.0 Demonstrate knowledge of basic types of printers, basic concepts, printer components, how they work, how they print onto a page, paper path, care and service techniques, and common problems. [Student Performance Standards: 34.01, 34.02, 34.03.]
- 35.0 Identify and describe basic network concepts and terminology, ability to determine whether a computer is networked, knowledge of procedures for swapping and configuring network interface cards, and knowledge of the ramifications of repairs when a computer is networked. [Student Performance Standards: 35.01, 35.02, 35.03, 35.04, 35.05, 35.06, 35.07, 35.08, 35.09, 35.10, 35.11, 35.12, 35.13, 35.14, 35.15, 35.16, 35.17, 35.18.]
- 36.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. [Student Performance Standards: 36.01, 36.02, 36.03.]
- 38.0 Demonstrate proficiency using graphical user interface (GUI) operating systems. [Student Performance Standards: 35.01, 35.02, 35.03, 35.04, 35.05, 35.06, 35.07, 35.08, 35.09, 35.10.]

### OCCUPATIONAL COMPLETION POINT - DATA CODE C

NETWORK SUPPORT ASSISTANT SOC Code 15-1070

Intended outcomes of OCP A and OCP B must be completed previously or concurrently. After completing the following additional competencies, the student will have achieved the occupational completion point of Network Support Help Desk and the student will be able to:

- 08.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. [Student Performance Standard: 08.18.]
- 37.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact. [Student Performance Standards: 37.09.]
- 40.0 Understand, describe, and explain internet connections. [Student Performance Standards: 40.01, 40.02, 40.03, 40.04, 40.05.]
- 41.0 Define networking terminology. [Student Performance Standards: 41.04, 41.05, 41.06, 41.07, 41.08, 41.09, 41.10, 41.11, 41.12, 41.13, 41.14.]
- 42.0 Explain how to connect copper media, optical media, and wireless media. [Student Performance Standards: 42.01, 42.02, 42.03, 42.04, 42.05, 42.06, 42.07, 42.08, 42.09, 42.10, 42.11, 42.12, 42.13, 42.14.]
- 43.0 Perform tasks related to the network cable testing and cable making. [Student Performance Standards: 43.01, 43.02, 43.04, 43.05, 43.06, 43.07, 43.08, 43.10, 43.11.]
- 44.0 Define network topologies, devices and connections. [Student Performance Standards: 44.01, 44.02, 44.03, 44.04, 44.05, 44.06, 44.07, 44.08.]
- 45.0 Define Ethernet fundamentals and operations. [Student Performance Standards: 45.01, 45.02, 45.03, 45.04, 45.05, 45.06, 45.07, 45.08, 45.09.]
- 46.0 Define and explain the functions of bridges and switches. [Student Performance Standards: 46.01, 46.02, 46.03, 46.04, 46.05, 46.06, 46.07, 46.08, 46.09.]
- 47.0 Explain the mathematical concepts and protocols behind the internet. [Student performance Standards: 47.01, 47.02, 47.03, 47.04, 47.05, 47.06, 47.07, 47.08, 47.09, 47.10, 47.11, 47.12.]

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- 48.0 Define and explain the difference between routed and routing protocols. [Student Performance Standards: 48.01, 48.02, 48.03, 48.04, 48.05, 48.06, 48.07, 48.08, 48.09, 48.10.]
- 49.0 Recognize, define, and explain functions of the transport layer. [Student Performance Standards: 49.01, 49.02, 49.03, 49.04, 49.05, 49.06, 49.07, 49.08, 49.09, 49.10, 49.11, 49.12, 49.13, 49.14.]
- 50.0 Explain, define, and identify the components of a WAN and router. [Student Performance Standards: 50.01, 50.02, 50.03, 50.04, 50.05, 50.06, 50.07.]
- 51.0 Describe and identify an operating system for a router, [Student Performance Standards: 51.01, 51.02, 51.03, 51.04, 51.05, 51.06, 51.07, 51.08, 51.09, 51.10, 51.11, 51.12, 51.13, 51.14, 51.15, 51.16, 51.17, 51.18, 51.19, 51.20.]
- 52.0 Explain how to establish connections between neighboring routers. [Student Performance Standards: 52.01, 52.02, 52.03, 52.04, 52.05, 52.06.]
- 53.0 Identify and explain the router boot sequence and file system. [Student Performance Standards: 53.01, 53.02, 53.03, 53.04, 53.05, 53.06, 53.07, 53.08, 53.09, 53.10.]
- 54.0 Identify and explain static and dynamic routing protocols. [Student Performance Standards: 54.01, 54.02, 54.03, 54.04, 54.05, 54.06, 54.07, 54.08, 54.09, 54.10.]
- 55.0 Describe and configure distance vector protocols, [Student Performance Standards: 55.01., 55.02, 55.03, 55.04, 55.05, 55.06, 55.07, 58.08, 55.09, 55.10, 55.11.]
- 56.0 Perform tasks related to protocol troubleshooting. [Student Performance Standards: 56.01, 56.02, 56.03, 56.04, 56.05, 56.06.]
- 57.0 Examine and test networks. [Student Performance Standards: 57.01, 57.02, 57.03, 57.04.]
- 58.0 Define, explain and describe access lists. [Student Performance Standards: 58.01, 58.02, 58.03, 58.04, 58.05.]

### OCCUPATIONAL COMPLETION POINT - DATA CODE D

NETWORK ADMINISTRATOR - SOC Code 15-1070

Intended outcomes of OCP A, OCP B, and OCP C must be completed previously. After completing the following additional competencies, the student will have achieved the occupational completion point of Network Support Administrator and the student will be able to:

- 08.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance. [Student Performance Standard: 08.18.]
- 20.0 Participate in work-based learning experiences. [Student Performance Standards: 20.29, 20.30.]
- 37.0 Provide network support and assistance by troubleshooting and diagnosing through direct contact remote access. [Student Performance Standards: 37.01, 37.02, 37.03.]
- 60.0 Develop electronic communications skills. [Student Performance Standards: 60.03, 60.05, 60.06.]
- 61.0 Perform logical and physical network design activities. [Student Performance Standards; 61.01, 61.02,. 61.03, 61.04, 61.05, 61.06.]
- 62.0 Demonstrate proficiency in selecting appropriate various routing protocols and IP routing configuration for various network

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- designs. [Student Performance Standards: 62.01, 62.02, 62.03, 62.04, 62.05, 62.06, 62.07, 62.08, 62.09, 62.10.]
- 63.0 Demonstrate proficiency in using network traffic filtering to improve network performance and provide basic levels of security. [Student Performance Standards: 63.01, 63.02.]
- 64.0 Perform network management activities related to documentation, security, performance, administration, troubleshooting and coping with environmental factors. [Student Performance Standards: 64.01, 64.02, 64.03, 64.04, 64.05.]
- 65.0 Identify and describe various wan functions, devices, and demonstrate understanding of the wan design process. [Student Performance Standards: 65.01, 65.02, 65.03.]
- 66.0 Describe the operation and implementation of virtual private networks. [Student Performance Standards: 66.01, 66.02, 66.03, 66.04.]

## OCCUPATIONAL COMPLETION POINT - DATA CODE E

SENIOR NETWORK ADMINISTRATOR SOC Code 15-1071

Intended outcomes of OCP A, OCP B, OCP C, and OCP D must be completed previously. After completing the following additional competencies, the student will have achieved the occupational completion point of Senior Network Administrator) and the student will be able to:

- 20.0 Participate in work-based learning experiences. [Student Performance Standards: 20.29, 20.30.]
- 70.0 Compare and contrast hierarchical network design models and scalable internetworks. [Student Performance Standards: 70.01, 70.02, 70.03, 70.04]
- 70.0 Discuss advanced IP addressing management. [Student Performance Standards: 71.01, 71.02, 71.03, 71.04, 71.05, 71.06, 71.07, 71.08, 71.09]
- 71.0 Demonstrate proficiency in basic router configuration. [Student Performance Standards: 72.01, 72.02, 72.03, 72.04, 72.05, 72.06, 72.07]
- 72.0 Demonstrate proficiency in the use of OSPF. [Student Performance Standards: 73.01, 73.02, 73.03, 73.04, 73.05]
- 73.0 Understand and discuss multiarea OSPF operation and configuration. [Student Performance Standards: 74.01, 74.02, 74.03, 74.04, 74.05]
- 74.0 Demonstrate the use of stub and totally stubby areas. [Student Performance Standards: 75.01, 75.02, 75.03, 75.04, 75.05, 75.06, 75.07]
- 75.0 Configure and define virtual links. [Student Performance Standards: 76.01, 76.02, 76.03, 76.04, 76.05, 76.06, 70.07]
- 76.0 Demonstrate proficiency in the use of EIGRP. [Student Performance Standards: 77.01, 77.02]
- 77.0 Demonstrate proficiency in route optimization. [Student Performance Standards: 78.01, 78.02]
- 78.0 Demonstrate proficiency in the use of BGP. [Student Performance Standards: 79.01, 79.02, 79.03, 79.04, 79.05, 79.06, 79.07, 79.08, 79.09, 79.10]
- 79.0 Define and show proficiency in security. [Student Performance Standards: 80.01, 80.02, 80.03, 80.04, 80.05, 80.06]
- 80.0 Use lab equipment, demonstrate the setup, configuration, connectivity of routers to create a small WAN. [Student Performance Standards: 81.01, 81.02, 81.03, 81.04]
- 81.0 Show the process of using modems and asynchronous dialup connections. [Student Performance Standards: 82.01, 82.02, 82.03, 82.04, 82.05]

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- 82.0 Configure and verify PPP configurations. [Student Performance Standards: 83.01, 83.02]
- 83.0 Configure and monitor ISDN and DDR. [Student Performance Standards: 84.01, 84.02, 84.03, 84.04, 84.05]
- 84.0 Configure dialer profiles. [Student Performance Standards: 85.01, 85.02, 85.03]
- 85.0 Create and troubleshoot X.25 configurations. [Student Performance Standards: 86.01, 86.02]
- 86.0 Configure and troubleshoot frame relay. [Student Performance Standards: 87.01, 87.02, 87.03, 87.04, 87.05, 87.06, 87.07]
- 87.0 Demonstrate the use of WAN backup and dial backup. [Student Performance Standards: 88.01, 88.02, 88.03, 88.04, 88.05]
- 88.0 Demonstrate the use of queuing and compression techniques. [Student Performance Standards: 89.01, 89.02]
- 89.0 Demonstrate the use of scaling IP addresses with NAT. [Student Performance Standards: 90.01, 90.02]
- 90.0 Demonstrate proficiency using AAA to scale access control. [Student Performance Standards: 91.01, 91.02, 91.03]
- 91.0 Discuss and explain emerging remote-access technologies. [Student Performance Standard: 92.01]
- 92.0 Demonstrate proficiency configuring a 700 series router. [Student Performance Standards: 93.01, 93.02, 93.03]
- 93.0 Understand and describe key characteristics of various switching technologies, LAN switching and the hierarchical model of network design, and the building-block approach. [Student Performance Standards: 94.01, 94.02, 94.03, 94.04, 94.05, 94.06]
- 94.0 Understand and describe campus networks, design models, and switching technologies. [Student Performance Standards: 95.01, 95.02, 95.03]
- 95.0 List and describe various types of LAN media. [Student Performance Standards: 96.01, 96.02, 96.03]
- 96.0 Show proficiency configuring a switch. [Student Performance Standards: 97.01, 97.02, 97.03]
- 97.0 Demonstrate proficiency configuring VLANs. [Student Performance Standards: 98.01, 98.02, 98.03, 98.04, 98.05]
- 98.0 Understand and explain spanning tree protocol (STP) AND redundant links. [Student Performance Standards: 99.01, 99.02, 99.03, 99.04]
- 99.0 Understand and define the commonly used protocols, routing techniques, and switching processes. Demonstrate proficiency routing between VLANs. [Student Performance Standards: 100.01, 100.02, 100.03]
- 100.0 Demonstrate proficiency with multilayer switching. [Student Performance Standards: 101.01, 101.02, 101.03, 101.04]
- 101.0 Demonstrate the use of hot standby routing protocol (HSRP). [Student Performance Standards: 102.01, 102.02]
- 102.0 Understand and use IGMP and multicasting. [Student Performance Standards: 103.01, 103.02, 103.03, 103.04, 103.05, 103.06]
- 103.0 Demonstrate proficiency restricting network access. [Student Performance Standards: 104.01, 104.02, 104.03]
- 104.0 Demonstrate proficiency using network troubleshooting tools and basic network management diagnostic tools. [Student Performance Standards: 105.01, 105.02, 105.03, 105.04, 105.05, 105.06, 105.07, 105.08]
- 105.0 List Performance Standards: 106.01, 106.02, 106.03, 106.04, 106.05]
- 107.0 Demonstrate proficiency troubleshooting TCP/IP, LAN switch environment, VLANs, frame relay, and ISDN. [Student Performance Standards: 107.01, 107.02, 107.03, 107.04, 107.05, 107.06, 107.07]

## Network Support Services

- 108.0 Demonstrate proficiency configuring and trouble shooting IPX and APPLETALK. [Student Performance Standards: 108.01, 108.02, 108.03, 108.04]
- 109.0 Demonstrate proficiency troubleshooting EIGRP, OSPF, and BGP. [Student Performance Standards: 109.01, 109.02, 109.03, 109.04]

### OCCUPATIONAL COMPLETION POINT - DATA CODE F

#### WIRELESS NETWORK ADMINISTRATOR - SOC Code 15-1080

Intended outcomes of OCP A, OCP B, OCP C, OCP D, and OCP E must be completed previously. After completing the following additional competencies, the student will have achieved the occupational completion point of Wireless Network Administrator and the student will be able to:

- 20.0 Participate in work-based learning experiences. [Student Performance Standards: 20.29, 20.30, 20.32]
- 120.0 Demonstrate proficiency in applying radio frequency (RF) technologies. [Student Performance Standards: 120.01, 120.02, 120.03, 120.04, 120.05, 120.06, 120.07.]
- 121.0 Develop an awareness of wireless LAN technologies. [Student Performance Standards: 121.01, 121.02, 121.03, 121.04]  
Perform implementation and management activities. [Student Performance Standards: 122.01, 122.02, 122.03, 122.04, 122.05, 122.06, 122.07, 122.08, 122.09, 122.10, 122.11, 122.12, 122.13, 122.14, 122.15]
- 122.0 Develop an awareness of wireless security systems. [Student Performance Standards: 123.01, 123.02, 123.03, 123.04, 123.05]
- 123.0 Demonstrate knowledge of wireless industry standards. [Student Performance Standards: 124.01, 124.02, 124.03, 124.04, 123.05]

### OCCUPATIONAL COMPLETION POINT - DATA CODE G

#### DATA COMMUNICATIONS ANALYST - SOC Code 15-1081

Intended outcomes of OCP A, OCP B, OCP C, OCP D, OCP E, OCP F must be completed previously. After completing the following additional competencies, the student will have achieved the occupational completion point of Data Communications Analyst and the student will be able to:

- 20.0 Participate in work-based learning experiences. [Student Performance Standards: 20.29, 20.30, 20.32]
- 130.0 Demonstrate a knowledge of general security concepts. [Student Performance Standards: 130.01, 130.02, 130.03, 130.04, 130.05, 130.06]
- 131.0 Develop an awareness of communication security concepts. [Student Performance Standards: 131.05, 131.06, 131.07, 131.08, 131.09]
- 132.0 Develop an awareness of network infrastructure security. [Student Performance Standards: 132.16, 132.17, 132.18, 132.19, 132.20, 132.21, 132.22, 132.23]
- 133.0 Develop an awareness of cryptography and its relation to security. [Student Performance Standards: 133.06, 133.07, 133.08]
- 134.0 Incorporate organizational and operational security in an appropriate and effective manner. [Student Performance Standards: 134.06, 134.07, 134.08, 134.09, 134.10, 134.11, 134.12, 134.13, 134.14]

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Program Title: Network Support Services  
Secondary Number: 8208000  
Postsecondary Number: B078000

OCCUPATIONAL COMPLETION POINT - DATA CODE A INFORMATION TECHNOLOGY ASSISTANT  
SOC Code 43-4000

Computing for College and Careers competencies :

INFORMATION SYSTEMS

01.0 DEMONSTRATE KNOWLEDGE, SKILL, AND APPLICATION OF INFORMATION SYSTEMS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 01.01 Develop keyboarding skills to enter and manipulate text and data. (LA.B.1.4.3)
- 01.02 Describe and use current and emerging computer technology and software to perform personal and business related tasks. (LA.B.2.4.4)
- 01.03 Identify and describe communications and networking systems used in workplace environments.
- 01.04 Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software. (LA.B.2.4.4, LA.A.2.4.6)
- 01.05 Demonstrate basic computer file management skills. (LA.A.2.4.2, LA.B.2.4.4, LA.B.2.4.6)
- 01.06 Troubleshoot problems with computer hardware peripherals and other office equipment. (LA.D.2.4.4)
- 01.07 Describe ethical issues and problems associated with computers and information systems.
- 01.08 Apply ergonomic principles applicable to the configuration of computer workstations.

WORKPLACE COMMUNICATIONS

02.0 DEMONSTRATE COMPREHENSION AND COMMUNICATION SKILLS-The student will be able to:

- 02.01 Read and comprehend technical and non-technical reading assignments related to course content including trade journals, books, magazines and electronic sources.
- 02.02 Write clear and well-organized research papers, integrating a variety of information.
- 02.03 Prepare and deliver an oral report with appropriate materials to the class
- 02.04 Participate in large group discussions as a member and/or a leader.
- 02.05 Take notes, organize, summarize, and paraphrase ideas and details.
- 02.06 Accurately follow written and oral instructions.
- 02.07 Interpret data on graphs, charts, diagrams, and tables commonly used in this industry/occupation.

## Network Support Services

- 03.0 USE TECHNOLOGY TO ENHANCE THE EFFECTIVENESS OF COMMUNICATION SKILLS-  
The student will be able to:
- 03.01 Select and use word processing software and accompanying features to enhance written business communications.  
(LA.B.1.4.1)
  - 03.02 Use the writing process to create and edit business documents appropriate to the subject matter, purpose, and audience.  
(LA.B.1.4.1, LA.B.1.4.2, LA.B.1.4.3)
  - 03.03 Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.  
(LA.B.2.4.1, LA.B.2.4.2)
  - 03.05 Use computer networks (e.g., Internet, on-line databases, e-mail) to facilitate collaborative or individual learning and communication.
  - 03.06 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.

## MANAGEMENT

- 04.0 DEVELOP AN AWARENESS OF MANAGEMENT FUNCTIONS AND ORGANIZATIONAL STRUCTURES AS THEY RELATE TO TODAY'S WORKPLACE AND EMPLOYER/ EMPLOYEE ROLES-The student will be able to:
- 04.01 Explore, design, implement, and evaluate organizational structures and cultures for managing project teams.
  - 04.02 Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.
  - 04.03 Collaborate with individuals and teams to complete tasks and solve business-related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.
- 05.0 PRACTICE QUALITY PERFORMANCE IN THE LEARNING ENVIRONMENT AND THE WORKPLACE-The student will be able to:
- 05.01 Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).
  - 05.02 Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).
- 06.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:
- 06.01 Demonstrate an awareness of quality service and the personal and professional standards required to establish an effective service-based culture in the workplace, business, or learning environment.
  - 06.02 Identify, analyze, and implement managerial skills necessary for maintaining a high quality work environment, goals, and strategic planning in business settings.

## Network Support Services

- 06.03 Follow accepted rules, regulations, policies, procedures, processes, and workplace safety.

## MATHEMATICS AND FINANCE

- 07.0 APPLY MATHEMATICAL OPERATIONS AND PROCESSES AS WELL AS FINANCIAL PLANNING STRATEGIES TO COMMONLY OCCURRING SITUATIONS IN THE WORKPLACE TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 07.01 Analyze, interpret, compile, and demonstrate the ability to present/communicate data in understandable and measurable terms using common statistical procedures. (MA.E.1.4.1, MA.E.A.4.2)
- 07.02 Use common standards of measurement including the metric system in solving work-related or business problems (e.g., length, weight, currency, time). (MA.B.3.4.1)
- 07.03 Select and use the correct mathematical processes and tools to solve complex problem situations that are typical of business settings and use formulas when appropriate. (MA.A.3.4.3)

## JOB READINESS AND CAREER DEVELOPMENT

- 08.0 ASSESS PERSONAL STRENGTHS AND WEAKNESSES AS THEY RELATE TO JOB OBJECTIVES, CAREER EXPLORATION, PERSONAL DEVELOPMENT, AND LIFE GOALS-The student will be able to:

- 08.01 Assess, analyze, and reassess individual talents, aptitudes, interests, and personal characteristics as they relate to potential future careers in business environments.
- 08.02 Use personal assessment tools to identify personal strengths and weaknesses related to learning and work environments.
- 08.03 Analyze job and career requirements and relate career interests to opportunities in the global economy.

- 09.0 INCORPORATE KNOWLEDGE GAINED FROM INDIVIDUAL ASSESSMENT AND JOB/CAREER EXPLORATION TO DESIGN AN INDIVIDUAL CAREER PLAN THAT REFLECTS THE TRANSITION FROM SCHOOL TO WORK, LIFELONG LEARNING, AND PERSONAL AND PROFESSIONAL GOALS-The student will be able to:

- 09.01 Analyze personal skills and aptitudes in comparison with various business related job and career options.
- 09.02 Use career resources to develop an information base that reflects local and global business related occupations and opportunities for continuing education and workplace experience.
- 09.03 Demonstrate job-seeking skills required for entry-level employment (e.g., resume, application, interview, and follow-up). (LA.C.3.4.4)
- 09.04 Design and initiate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations.
- 09.05 Refine and implement a plan to facilitate personal growth and skill development related to anticipated job requirements and career expectations.
- 09.06 Demonstrate an awareness of specific job requirements and career paths (e.g., requirements, characteristics needed) in business environments.
- 09.07 Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals.

## Network Support Services

09.08 Build mentor relationships with local professionals in the industry.

## HUMAN RELATIONS/INTERPERSONAL SKILLS

10.0 DEMONSTRATE HUMAN RELATIONS/INTERPERSONAL SKILLS APPROPRIATE FOR THE WORKPLACE-The student will be able to:

- 10.01 Accept constructive criticism. (SS.B.1.4.5)
- 10.02 Apply appropriate strategies to manage and resolve conflicts in work situations. (LA.D.1.4.2, SS.B.1.4.5)
- 10.03 Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, professional dress, etc.).

## ADMINISTRATIVE PROCEDURES

13.0 PERFORM FUNCTIONS AND RESPONSIBILITIES TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 13.02 Demonstrate knowledge of ethical behavior in a business environment (e.g., confidentiality of information, employee right to know, hiring practices, plagiarism, copyright violations, sexual harassment, mission statement, code of ethics, etc.).

## NETWORK/SOFTWARE SUPPORT

41.0 PERFORM E-MAIL ACTIVITIES-The student will be able to:

- 41.01 Describe e-mail capabilities and functions.
- 41.09 Use the Internet to perform e-mail activities.

42.0 DEMONSTRATE OPERATING SYSTEMS-The student will be able to:

- 42.01 Identify operating system file naming conventions.
- 42.10 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
- 42.12 Demonstrate a working knowledge of standard file formats.
- 42.14 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).

## INFORMATION TECHNOLOGY

67.0 DEVELOP AN AWARENESS OF EMERGING TECHNOLOGIES-The student will be able to:

- 67.01 Compare and contrast various methods of evaluation for emerging technologies.
- 67.02 Demonstrate knowledge of the process of planning upgrades and changeovers.
- 67.03 Compare and contrast emerging technologies (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, etc.).

OR

## Network Support Services

Introduction to Information Technology competencies:

### INFORMATION SYSTEMS

01.0 DEMONSTRATE KNOWLEDGE, SKILL, AND APPLICATION OF INFORMATION SYSTEMS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 01.01 Develop keyboarding skills to enter and manipulate text and data.
- 01.02 Describe and use current and emerging computer technology and software to perform personal and business related tasks.
- 01.03 Identify and describe communications and networking systems used in workplace environments.
- 01.04 Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.
- 01.05 Troubleshoot problems with computer hardware peripherals and other office equipment.
- 01.07 Describe ethical issues and problems associated with computers and information systems.

### WORKPLACE COMMUNICATIONS

02.0 USE TECHNOLOGY TO APPLY AND ENHANCE COMMUNICATION SKILLS IN TECHNICAL READING, WRITING, SPEAKING, LISTENING, AND VIEWING-The student will be able to:

- 02.03 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
- 02.62 Organize ideas and communicate oral and written messages appropriate for information technology environments.
- 02.63 Collaborate with individuals and teams to complete tasks and solve information technology problems.
- 02.64 Identify, define, and discuss professional information technology terminology appropriate for internal and external communications in an information technology environment.
- 02.65 Apply the writing process to the creation of appropriate documents following designated business formats.
- 02.66 Demonstrate an awareness of project management concepts and tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration, etc.).

03.0 USE TECHNOLOGY TO ENHANCE THE EFFECTIVENESS OF COMMUNICATION SKILLS-The student will be able to:

- 03.03 Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.
- 03.06 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.

### MANAGEMENT

04.0 DEVELOP AN AWARENESS OF MANAGEMENT FUNCTIONS AND ORGANIZATIONAL STRUCTURES AS THEY RELATE TO TODAY'S WORKPLACE AND EMPLOYER/ EMPLOYEE ROLES-The student will be able to:

## Network Support Services

- 04.01 Explore, design, implement, and evaluate organizational structures and cultures. Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.
- 04.02 Collaborate with individuals and teams to complete tasks and solve business-related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.

### 05.0 PRACTICE QUALITY PERFORMANCE IN THE LEARNING ENVIRONMENT AND THE WORKPLACE-The student will be able to:

- 05.01 Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).
- 05.02 Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).

### 06.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB

OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 06.03 Demonstrate awareness of the following workplace essentials: Quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming.

## MATHEMATICS AND FINANCE

### 07.0 APPLY MATHEMATICAL OPERATIONS AND PROCESSES AS WELL AS FINANCIAL PLANNING STRATEGIES TO COMMONLY OCCURRING SITUATIONS IN THE WORKPLACE TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 07.01 Analyze, interpret, compile, and demonstrate the ability to present/communicate data in understandable and measurable terms using common statistical procedures.
- 07.02 Use common standards of measurement including the metric system in solving work-related or business problems (e.g., length, weight, currency, time).
- 07.03 Select and use the correct mathematical processes and tools to solve complex problem situations that are typical of business settings and use formulas when appropriate.

## JOB READINESS AND CAREER DEVELOPMENT

### 08.0 ASSESS PERSONAL STRENGTHS AND WEAKNESSES AS THEY RELATE TO JOB OBJECTIVES, CAREER EXPLORATION, PERSONAL DEVELOPMENT, AND LIFE GOALS-The student will be able to:

- 08.02 Use personal assessment tools to identify personal strengths and weaknesses related to learning and work environments.

## Network Support Services

08.03 Analyze job and career requirements and relate career interests to opportunities in the global economy.

09.0 INCORPORATE KNOWLEDGE GAINED FROM INDIVIDUAL ASSESSMENT AND JOB/CAREER EXPLORATION TO DESIGN AN INDIVIDUAL CAREER PLAN THAT REFLECTS THE TRANSITION FROM SCHOOL TO WORK, LIFELONG LEARNING, AND PERSONAL AND PROFESSIONAL GOALS-The student will be able to:

09.15 Research, compare, and contrast information technology career clusters (e.g., characteristics needed, skills required, education required, industry certifications, advantages and disadvantages of information technology careers, the need for information technology workers, etc.).

09.16 Describe the variety of occupations and professions within the world of information technology including those where information technology is either in a primary focus or in a supportive role.

09.17 Describe job requirements for the variety of occupations and professions within the global world of information technology.

09.18 Analyze personal skills and aptitudes in comparison with information technology career opportunities.

09.19 Refine and implement a plan to facilitate personal growth and skill development related to information technology career opportunities.

09.20 Develop and maintain an electronic career portfolio, to include, but not limited to the Resume and Letter of Application.

10.0 DEMONSTRATE HUMAN RELATIONS/INTERPERSONAL SKILLS APPROPRIATE FOR THE WORKPLACE-The student will be able to:

10.01 Accept constructive criticism.

10.03 Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, professional dress, etc.).

## WORK-BASED LEARNING

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES-The student will be able to:

20.44 Participate in work-based learning experiences in an information technology environment.

20.46 Discuss the use of technology in an information technology environment.

## NETWORK/SOFTWARE SUPPORT

41.0 PERFORM E-MAIL ACTIVITIES-The student will be able to:

41.01 Describe e-mail capabilities and functions.

41.02 Identify components of an e-mail message.

41.03 Identify the components of an e-mail address.

41.04 Identify when to use different e-mail options.

41.05 Attach a file to an e-mail message.

41.06 Forward an e-mail message.

41.07 Use an address book.

41.08 Reply to an e-mail message.

41.09 Use the Internet to perform e-mail activities.

41.10 Identify the appropriate use of e-mail and demonstrate related e-mail etiquette.

## Network Support Services

- 41.12 Identify when to include information from an original e-mail message in a response.
- 41.13 Identify common problems associated with widespread use of e-mail.

### 42.0 DEMONSTRATE KNOWLEDGE OF DIFFERENT OPERATING SYSTEMS—The student will be able to:

- 42.01 Identify operating system file naming conventions.
- 42.10 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
- 42.12 Demonstrate a working knowledge of standard file formats.
- 42.14 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).

#### **WEB DESIGN**

### 55.0 DEMONSTRATE PROFICIENCY NAVIGATING THE INTERNET, INTRANET, AND THE WWW—The student will be able to:

- 55.01 Identify and describe Web terminology.
- 55.10 Demonstrate proficiency in using the basic features of GUI browsers (e.g., setting bookmarks, basic configurations, e-mail configurations, address book).
- 55.11 Define Universal Resource Locators (URLs) and associated protocols (e.g., .com, .org, .edu, .gov, .net, .mil).
- 55.14 Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.
- 55.15 Trace the evolution of the Internet from its inception to the present and into the future.
- 55.16 Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, etc.).
- 55.17 Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF, etc.).
- 55.18 Identify effective Boolean search strategies.

### 56.0 DEMONSTRATE PROFICIENCY USING HTML COMMANDS—The student will be able to:

- 56.01 Identify elements of a Web page.
- 56.02 Describe individual Web page layouts and content (e.g., writing for the Web, Web structure).
- 56.03 Define basic HTML terminology.
- 56.04 Analyze HTML source code developed by others.
- 56.05 Create Web pages using basic HTML tags (e.g., links, lists, character styles, text alignment, and tables).
- 56.06 Use storyboarding techniques for subsequent Web pages (e.g., linear, hierarchical).
- 56.08 Edit and test HTML documents for accuracy and validity.
- 56.17 Use basic functions of WYSIWYG editors.
- 56.18 Use basic functions of HTML, DHTML, and XML editors and converters.
- 56.19 Enhance web pages through the addition of images and graphics including animation.

### 57.0 DEMONSTRATE PROFICIENCY IN PAGE DESIGN APPLICABLE TO THE WWW—The student will be able to:

- 57.01 Develop an awareness of acceptable Web page design, including index pages in relation to the rest of the Web site.

## Network Support Services

- 57.02 Describe and apply color theory as it applies to Web page design (e.g., background and text color).
- 57.04 Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD ROMs).
- 57.05 Use image design software to create and edit images.
- 57.25 Demonstrate proficiency in publishing to the Internet.
- 57.26 Demonstrate proficiency in adding downloadable forms to web pages.
- 57.27 Explain the need for web-based applications.

63.0 DEMONSTRATE PROFICIENCY USING SPECIALIZED WEB DESIGN SOFTWARE-The student will be able to:

- 63.01 Compare and contrast various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).
- 63.02 Demonstrate use of various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).

## INFORMATION TECHNOLOGY

64.0 DEVELOP AN AWARENESS OF THE INFORMATION TECHNOLOGY INDUSTRY-The student will be able to:

- 64.01 Explain how information technology impacts the operation and management of business and society.
- 64.04 Explain the emergence of e-commerce and e-government and the potential impact on business and society.
- 64.05 Explain the emergence of a paperless society.

65.0 DEVELOP AN AWARENESS OF MICROPROCESSORS AND DIGITAL COMPUTERS-The student will be able to:

- 65.01 Describe the evolution of the digital computer.
- 65.02 Explain the general architecture of a microcomputer system.
- 65.03 Explain the evolution of microprocessors.
- 65.04 Explain software hierarchy and its impact on microprocessors.
- 65.05 Explain the need for and use of peripherals.
- 65.06 Demonstrate proficiency using peripherals.
- 65.07 Identify the basic concepts of computer maintenance and upgrades.
- 65.08 Differentiate between diagnosing and troubleshooting.

66.0 DEVELOP AN AWARENESS OF PROGRAMMING LANGUAGES-The student will be able to:

- 66.01 Explain the history of programming languages.
- 66.02 Explain the need for and use of compilers.
- 66.03 Explain how compilers work.
- 66.04 Identify the three types of programming design approaches (e.g., top-down, structured, and object-oriented).

67.0 DEVELOP AN AWARENESS OF EMERGING TECHNOLOGIES-The student will be able to:

- 67.01 Compare and contrast various methods of evaluation for emerging technologies.
- 67.02 Demonstrate knowledge of the process of planning upgrades and changeovers.
- 67.03 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless,

## Network Support Services

wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, etc.).

### 69.0 DEMONSTRATE AN UNDERSTANDING OF THE SEVEN LAYERS OF THE OPEN SYSTEMS INTERFACE (OSI) MODEL-The student will be able to:

- 69.01 Describe the evolution of OSI from its inception to the present and into the future.
- 69.02 Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.
- 69.04 Identify types of networks and how they work.
- 69.06 Identify the role of servers and clients on a network.
- 69.07 Identify benefits and risks of networked computing.
- 69.08 Identify the relationship between computer networks and other communications networks (i.e. telephone systems).
- 69.09 Identify Intranets, Extranets and how they relate to the Internet.
- 69.11 Demonstrate basic understanding of network administration.

## SOFTWARE APPLICATIONS

### 70.0 DEMONSTRATE PROFICIENCY USING COMMON SOFTWARE APPLICATIONS-The student will be able to:

- 70.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).
- 70.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).

### 71.0 DEMONSTRATE PROFICIENCY USING SPECIALIZED SOFTWARE APPLICATIONS-The student will be able to:

- 71.01 Compare and contrast the appropriate use of specialized software applications (e.g., (OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation process control, materials management, etc.).
- 71.02 Demonstrate awareness of specialized software applications (e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management, etc.)
- 71.06 Demonstrate the ability to incorporate digital sound.

## OCCUPATIONAL COMPLETION POINT - DATA CODE B

COMPUTER SUPPORT ASSISTANT - SOC Code 15-1041

Intended outcomes of OCP A must be completed previously or concurrently.

## MANAGEMENT

### 08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

## Network Support Services

08.17 Develop strategies for resolving customer conflicts.

### NETWORK/SOFTWARE SUPPORT

**30.0 IDENTIFY, INSTALL, CONFIGURE, AND UPGRADE DESKTOP AND SERVER COMPUTER MODULES AND PERIPHERALS, FOLLOWING ESTABLISHED BASIC PROCEDURES FOR SYSTEM ASSEMBLY AND DISASSEMBLY OF FIELD REPLACEABLE MODULES**—The student will be able to:

- 30.01 Identify and describe the functions of main processing boards (e.g., CPUs, RAM, ROM, bus architecture).
- 30.01 Identify and describe the functions of communication ports (e.g., serial and parallel ports).
- 30.03 Identify and describe the functions of peripheral devices (e.g., scanners, modems, hard drives, printers).
- 30.04 Identify and describe the components of portable systems (e.g., battery, LCD, AC adapter, PDAs).
- 30.05 Troubleshoot, install and upgrade computers and peripherals.
- 30.06 Perform system hardware setup Demonstrate an understanding of input/output devices.
- 30.07 Installation and configuration of applications software, hardware, and device drivers.
- 30.08 Demonstrate an understanding of the operation and purpose of hardware components.
- 30.09 Install operating system software.
- 30.10 Customize operating systems.
- 30.11 Install application software.
- 30.12 Perform storage formatting and preparation activities.
- 30.13 Identify data measurement (e.g., bits, bytes, kilobytes).
- 30.14 Install and Configure RAID.
- 30.15 Recognize and report on server room environmental issues (temperature, humidity/ESD/power surges, back-up).

**31.0 DIAGNOSE AND TROUBLESHOOT COMMON MODULE PROBLEMS AND SYSTEM MALFUNCTIONS OF COMPUTER SOFTWARE, HARDWARE, PERIPHERALS, AND OTHER OFFICE EQUIPMENT**—The student will be able to:

- 31.01 Troubleshoot a personal computer system
- 31.02 Identify configuration problems.
- 31.03 Identify software problems.
- 31.04 Identify hardware malfunctions.
- 31.05 Identify network malfunctions
- 31.06 Resolve computer error messages.
- 31.07 Understand and troubleshoot memory and cache systems.
- 31.08 Verify that drives are the appropriate type.
- 31.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.

**32.0 IDENTIFY ISSUES, PROCEDURES AND DEVICES FOR PROTECTION WITHIN THE COMPUTING ENVIRONMENT, INCLUDING PEOPLE, HARDWARE AND THE SURROUNDING WORKSPACE**—The student will be able to:

- 32.01 Apply basic rules for hardware safety.
- 32.02 Demonstrate proficiency in basic preventative hardware maintenance.

## Network Support Services

- 32.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
  - 32.04 Apply ergonomic principles applicable to the configuration of computer workstations.
  - 32.05 Describe ethical issues and problems associated with computers and information systems.
- 33.0 IDENTIFY SPECIFIC TERMINOLOGY, FACTS, WAYS AND MEANS OF DEALING WITH CLASSIFICATIONS, CATEGORIES AND PRINCIPLES OF MOTHERBOARDS, PROCESSORS AND MEMORY IN DESKTOP AND SERVER COMPUTER SYSTEMS**—The student will be able to:
- 33.01 Identify EDO RAM, DRAM, SRAM, RIMM, VRAM, SDRAM, and WRAM.
  - 33.02 Identify memory banks, memory chips (8-bit, 16-bit, and 32-bit), SIMMS (Single In-line Memory Module), DIMMS (Dual In-line Memory Module), parity chips versus non-parity chips.
  - 33.03 Identify printer parallel port, COM/serial port, floppy drive, hard drive, Memory, and Boot sequence.
- 34.0 DEMONSTRATE KNOWLEDGE OF BASIC TYPES OF PRINTERS, BASIC CONCEPTS, PRINTER COMPONENTS, HOW THEY WORK, HOW THEY PRINT ONTO A PAGE, PAPER PATH, CARE AND SERVICE TECHNIQUES, AND COMMON PROBLEMS**—The student will be able to:
- 34.01 Identify types of printers—Laser, Inkjet, Dot Matrix.
  - 34.02 Identify care and service techniques and common problems with primary printer types.
  - 34.03 Implement and manage printing on a network.
- 35.0 IDENTIFY AND DESCRIBE BASIC NETWORK CONCEPTS AND TERMINOLOGY, ABILITY TO DETERMINE WHETHER A COMPUTER IS NETWORKED, KNOWLEDGE OF PROCEDURES FOR SWAPPING AND CONFIGURING NETWORK INTERFACE CARDS, AND KNOWLEDGE OF THE RAMIFICATIONS OF REPAIRS WHEN A COMPUTER IS NETWORKED**—The student will be able to:
- 35.01 Define networking and describe the purpose of a network.
  - 35.02 Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).
  - 35.03 Describe the various types of network topologies.
  - 35.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
  - 35.05 Configure network and verify network connectivity.
  - 35.06 Discuss the responsibilities of the network administrator (e.g., rights and responsibilities).
  - 35.07 Develop user logon procedures.
  - 35.08 Utilize network management infrastructures (e.g., network monitoring, alerting, security) to perform administrative tasks.
  - 35.09 Identify common backup strategies and procedures.
  - 35.10 Select and use appropriate electronic communications software and hardware for specific tasks.
  - 35.11 Compare and contrast Internet software and protocols.
  - 35.12 Diagnose and resolve electronic communications operational problems.
  - 35.13 Design and implement directory tree structures.
  - 35.14 Install services tools (SNMP, backup software)
  - 35.15 Perform full backup and verify backup

## Network Support Services

- 35.16 Identify bottlenecks (e.g., processor, bus transfer, I/O, disk I/O, network I/O, memory).
- 35.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
- 35.18 Document and test disaster recovery plan regularly, and update as needed.

### 36.0 PERFORM END USER SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH TELEPHONE, E-MAIL, Internet, REMOTE ACCESS, OR DIRECT CONTACT—The student will be able to:

- 36.01 Apply call center vocabulary.
- 36.02 Listen and input information simultaneously.
- 36.03 Apply first response assistance for minor repair work.

### 38.0 DEMONSTRATE PROFICIENCY USING GRAPHICAL USER INTERFACE (GUI) OPERATING SYSTEMS—The student will be able to:

- 38.01 Identify parts of GUI windows.
- 38.02 Create and use icons.
- 38.03 Demonstrate proficiency in using menu systems.
- 38.04 Demonstrate proficiency in using pointing and selection devices.
- 38.05 Identify keyboard shortcuts and special function keys.
- 38.06 Demonstrate proficiency in manipulating windows.
- 38.07 Utilize help systems and hypertext links.
- 38.08 Create, organize, and maintain file system directories.
- 38.09 Organize desktop objects.
- 38.10 Run multiple applications.

## OCCUPATIONAL COMPLETION POINT - DATA CODE C

NETWORK SUPPORT ASSISTANT SOC Code 15-1070

Intended outcomes of OCP A and OCP B must be completed previously or concurrently.

### 08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE—The student will be able to:

- 08.18 Develop diplomatic methods to communicate with customers.

## NETWORK/SOFTWARE SUPPORT

### 37.0 PERFORM END USER SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH TELEPHONE, E-MAIL, REMOTE ACCESS, OR DIRECT CONTACT—The student will be able to:

- 37.09 Apply first response assistance for minor repair work.

bps, Mbps, and Gbps as units of bandwidth.

### 41.04 Explain the development of the Open System Interconnection model(OSI). 40.0 UNDERSTAND, DESCRIBE, AND EXPLAIN INTERNET CONNECTIONS—The student will be able to:

- 40.01 Understand the physical connectivity necessary for a computer to connect to the Internet.
- 40.02 Recognize the primary components of a computer.
- 40.03 Install and troubleshoot network interface cards and/or modems.

## Network Support Services

- 40.04 Use basic testing procedures to test the Internet connection.
- 40.05 Demonstrate a basic understanding of the use of Web browsers and plug-ins.

41.05 DEFINE NETWORKING TERMINOLOGY—The student will be able to:

- 41.01 Explain the importance of bandwidth in networking.
- 41.02 Identify bps, k
- 41.05 List the advantages of a layered approach.
- 41.06 Identify each of the seven layers of the OSI model.
- 41.07 Identify the four layers of the TCP/IP model.
- 41.08 Describe the similarities and differences between the two models.
- 41.09 Briefly outline the history of networking.
- 41.10 Identify devices used in networking.
- 41.11 Understand the role of protocols in networking.
- 41.12 Define LAN, WAN, MAN, and SAN.
- 41.13 Explain VPNs and their advantages.
- 41.14 Describe the differences between intranets and extranets.

42.0 EXPLAIN HOW TO CONNECT COPPER MEDIA, OPTICAL MEDIA, AND WIRELESS MEDIA—The student will be able to:

- 42.01 Discuss the electrical properties of matter.
- 42.02 Define voltage, resistance, impedance, current, and circuits.
- 42.03 Describe the specifications and performances of different types of cable.
- 42.04 Describe coaxial cable and its advantages and disadvantages over other types of cable.
- 42.05 Describe shielded twisted-pair (STP) cable and unshielded twisted-pair cable and its uses.
- 42.06 Describe (UTP) and their uses.
- 42.07 Discuss the characteristics of straight-through, crossover, and rollover cables and where each is used.
- 42.08 Explain the basics of fiber-optic cable.
- 42.09 Describe how fibers can guide light for long distances.
- 42.10 Describe multimode and single-mode fiber.
- 42.11 Describe how fiber is installed.
- 42.12 Describe the type of connectors and equipment used with fiber-optic cable.
- 42.13 Explain how fiber is tested to ensure that it will function properly.
- 42.14 Discuss safety issues dealing with fiber-optics.

43.0 PERFORM TASKS RELATED TO THE NETWORK CABLE TESTING AND CABLE MAKING—The student will be able to:

- 43.01 Differentiate between sine waves and square waves.
- 43.02 Define and calculate exponents and logarithms.
- 43.03 Define and calculate decibels.
- 43.04 Define basic terminology related to time, frequency, a noise.
- 43.05 Differentiate between digital bandwidth and analog bandwidth.
- 43.06 Compare and contrast noise levels on various types of cabling.
- 43.07 Define and describe the affects of attenuation and impedance mismatch.
- 43.08 Define crosstalk, near-end crosstalk, far-end crosstalk, and power sum near-end crosstalk.
- 43.09 Describe how crosstalk and twisted pairs help reduce noise.
- 43.10 Describe the ten copper cable tests defined in TIA/EIA-568-B.
- 43.11 Describe the difference between Category 5 and Category 6 cable.

## Network Support Services

44.0 DEFINE NETWORK TOPOLOGIES, DEVICES AND CONNECTIONS-The student will be able to perform tasks related to the following:

- 44.01 Identify characteristics of Ethernet networks.
- 44.02 Identify straight-through, crossover, and rollover cable
- 44.03 Describe the function, advantages, and disadvantages of repeaters, hubs, bridges, switches, and wireless network components.
- 44.04 Describe the function of peer-to-peer networks.
- 44.05 Describe the function, advantages, and disadvantages of client-server networks.
- 44.06 Describe and differentiate between serial, Integrated Services Digital Network (ISDN), digital subscriber line (DSL), and cable modem WAN connections.
- 44.07 Identify router serial ports and their cable and connectors.
- 44.08 Identify and describe the placement of equipment used in various WAN configurations.

45.0 DEFINE ETHERNET FUNDAMENTALS AND OPERATIONS-The student will be able to:

- 45.01 Describe the basics of Ethernet technology.
- 45.02 Explain naming rules of Ethernet technology.
- 45.03 Define how Ethernet and the OSI model interact.
- 45.04 Describe the Ethernet framing process and frame structure.
- 45.05 List Ethernet frame field names and purposes.
- 45.06 Identify the characteristics of CSMA/CD.
- 45.07 Describe the key aspects of Ethernet timing, interframe spacing and backoff time after a collision.
- 45.08 Define Ethernet errors and collisions.
- 45.09 Explain the concept of auto-negotiation in relation to speed and duplex.

46.0 DEFINE AND EXPLAIN THE FUNCTIONS OF BRIDGES AND SWITCHES-The student will be able to:

- 46.01 Define bridging and switching.
- 46.02 Define and describe the content-addressable memory (CAM) table.
- 46.03 Define latency.
- 46.04 Describe store-and forward and cut-through switching modes.
- 46.05 Explain Spanning-Tree Protocol (STP).
- 46.06 Define collisions, broadcasts, collision domains, and broadcast domains.
- 46.07 Identify the Layer 1, 2, and 3 devices used to create collision domains and broadcast domains.
- 46.08 Discuss data flow and problems with broadcasts.
- 46.09 Explain network segmentation and list the devices used to create segments.

47.0 EXPLAIN THE MATHEMATICAL CONCEPTS AND PROTOCOLS BEHIND THE INTERNET-The student will be able to:

- 47.01 Explain why the Internet was developed and how TCP/IP fits the design of the Internet.
- 47.02 List the four layers of the TCP/IP model.
- 47.03 Describe the functions of each layer of the TCP/IP model.
- 47.04 Compare the OSI model and the TCP/IP model.
- 47.05 Describe the function and structure of IP addresses.

## Network Support Services

- 47.06 Understand why subnetting is necessary.
- 47.07 Explain the difference between public and private addressing.
- 47.08 Understand the function of reserved IP addresses.
- 47.09 Explain the use of static and dynamic addressing for a device.
- 47.10 Understand how dynamic addressing can be done using RARP, BootP and DHCP.
- 47.11 Use ARP to obtain the MAC address to send a packet to another device.
- 47.12 Understand the issues related to addressing between networks.

### 48.0 DEFINE AND EXPLAIN THE DIFFERENCE BETWEEN ROUTED AND ROUTING PROTOCOLS-The student will be able to:

- 48.01 Describe routed (routable) protocols.
- 48.02 List the steps of data encapsulation in an internetwork as data is routed to one or more Layer 3 devices.
- 48.03 Describe connectionless and connection-oriented delivery.
- 48.04 Name the IP packet fields.
- 48.05 Describe process of routing.
- 48.06 Compare and contrast different types of routing protocols.
- 48.07 List and describe several metrics used by routing protocols.
- 48.08 List several uses for subnetting.
- 48.09 Determine the subnet mask for a given situation.
- 48.10 Use a subnet mask to determine the subnet ID.

### 49.0 RECOGNIZE, DEFINE, AND EXPLAIN FUNCTIONS OF THE TRANSPORT LAYER-The student will be able to:

- 49.01 Describe the functions of the TCP/IP transport layer.
- 49.02 Describe flow control.
- 49.03 Describe the processes of establishing a connection between peer systems.
- 49.04 Describe windowing.
- 49.05 Describe acknowledgment.
- 49.06 Identify and describe transport layer protocols.
- 49.07 Describe TCP and UDP header formats.
- 49.08 Describe TCP and UDP port numbers and ports used for services and clients.
- 49.09 List the major protocols of the TCP/IP application layer.
- 49.10 Provide a brief description of the features and operation of well-known TCP/IP applications.
- 49.11 Describe TCP and UDP with its function.
- 49.12 Describe TCP synchronization and flow control.
- 49.13 Describe multiple conversations between hosts.
- 49.14 Understand the differences and the relationship between MAC addresses, IP addresses, and port numbers.

### 50.0 EXPLAIN, DEFINE, AND IDENTIFY THE COMPONENTS OF A WAN AND ROUTER-The student will be able to:

- 50.01 Identify organizations responsible for WAN standards.
- 50.02 Explain the difference between a WAN and LAN and the type of addresses each uses.
- 50.03 Describe the role of a router in a WAN.
- 50.04 Identify internal components of the router and describe their functions.
- 50.05 Describe the physical characteristics of the router.
- 50.06 Identify common ports on a router.
- 50.07 Properly connect FastEthernet, serial WAN, and console ports.

## Network Support Services

- 51.0 DESCRIBE AND IDENTIFY AN OPERATING SYSTEM FOR A ROUTER-The student will be able to:
- 51.01 Describe the purpose of the IOS.
  - 51.02 Describe the basic operation of the IOS.
  - 51.03 Identify various IOS features.
  - 51.04 Identify the methods to establish a CLI session with the router.
  - 51.05 Move between the user EXEC and privileged EXEC modes.
  - 51.06 Establish a HyperTerminal session on a router.
  - 51.07 Log into a router.
  - 51.08 Use the help feature in the command line interface.
  - 51.09 Troubleshoot command errors.
  - 51.10 Name a router.
  - 51.11 Set passwords.
  - 51.12 Examine show commands.
  - 51.13 Configure a serial interface.
  - 51.14 Configure an Ethernet interface.
  - 51.15 Execute changes to a router.
  - 51.16 Save changes to a router.
  - 51.17 Configure an interface description.
  - 51.18 Configure a message-of-the-day banner.
  - 51.19 Configure host tables.
  - 51.20 Understand the importance of backups and documentation.
- 52.0 EXPLAIN HOW TO ESTABLISH CONNECTIONS BETWEEN NEIGHBORING ROUTERS-The student will be able to:
- 52.01 Enable and disable Protocols.
  - 52.02 Determine which neighboring devices are connected to which local interfaces.
  - 52.03 Gather network address information about neighboring devices using CDP.
  - 52.04 Establish, Verify, Disconnect, Suspend a Telnet connection.
  - 52.05 Perform alternative connectivity tests.
  - 52.06 Troubleshoot remote terminal connections.
- 53.0 IDENTIFY AND EXPLAIN THE ROUTER BOOT SEQUENCE AND FILE SYSTEM-The student will be able to:
- 53.01 Identify the stages of the router boot sequence.
  - 53.02 Determine how a router locates and loads its operating system.
  - 53.03 Use the boot system command.
  - 53.04 Identify the configuration register values.
  - 53.05 Briefly describe the files used by the Router IOS and their functions.
  - 53.06 List the locations on the router of the different file types.
  - 53.07 Briefly describe the parts of the IOS name.
  - 53.08 Save and restore configuration files using TFTP and copy-and paste.
  - 53.09 Load an IOS image using TFTP.
  - 53.10 Load an IOS image using XModem.
  - 53.11 Verify the file system using show commands.
- 54.0 IDENTIFY AND EXPLAIN STATIC AND DYNAMIC ROUTING PROTOCOLS-The student will be able to:
- 54.01 Explain the significance of static routing.
  - 54.02 Configure static and default routes.
  - 54.03 Verify and troubleshoot static and default routes.

## Network Support Services

- 54.04 Identify the classes of routing protocols.
- 54.05 Identify distance vector routing protocols.
- 54.06 Identify link-state routing protocols.
- 54.07 Describe the basic characteristics of common routing protocols.
- 54.08 Identify interior gateway protocols.
- 54.09 Identify exterior gateway protocols.
- 54.10 Enable Routing Information Protocol (RIP) on a router.

55.0 DESCRIBE AND CONFIGURE DISTANCE VECTOR PROTOCOLS-The student will be able to:

- 55.01 Describe how routing loops can occur in distance vector routing.
- 55.02 Describe several methods used by distance vector routing protocols to ensure that routing information is accurate.
- 55.03 Configure RIP.
- 55.04 Use the ip classless command.
- 55.05 Troubleshoot RIP.
- 55.06 Configure RIP for load balancing.
- 55.07 Configure static routes for RIP.
- 55.08 Verify RIP.
- 55.09 Configure IGRP.
- 55.10 Verify IGRP operation.
- 55.11 Troubleshoot IGRP.

56.0 PERFORM TASKS RELATED TO PROTOCOL TROUBLESHOOTING-The student will be able to:

- 56.01 Describe ICMP.
- 56.02 Describe the ICMP message format and error message types.
- 56.03 Identify potential causes of specific ICMP error messages.
- 56.04 Describe ICMP control messages.
- 56.05 Identify a variety of ICMP control messages used in networks today.
- 56.06 Determine the causes for ICMP control messages.

57.0 EXAMINE AND TEST NETWORKS--The student will be able to:

- 57.01 Use the commands to gather detailed information about the routes installed on the router.
- 57.02 Configure a default route or default network.
- 57.03 Understand how a router uses both Layer 2 and Layer addressing to move data through the network.
- 57.04 Use commands to the router at different OSI layers.

58.0 DEFINE, EXPLAIN AND DESCRIBE ACCESS LISTS-The student will be able to:

- 58.01 Describe the differences between standard and extended ACLs.
- 58.02 Explain the rules for placement of ACLs.
- 58.03 Create and apply named ACLs.
- 58.04 Describe the function of firewalls.
- 58.05 Use ACLs to restrict virtual terminal access.

### OCCUPATIONAL COMPLETION POINT - DATA CODE D

NETWORK ADMINISTRATOR - SOC Code 15-1070

Intended outcomes of OCP A, OCP B, and OCP C must be completed previously.

### MANAGEMENT

## Network Support Services

**08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE**—The student will be able to:

08.18 Develop diplomatic methods to communicate with customers.

### WORK-BASED LEARNING

**20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES**—The student will be able to:

20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4

20.30 Discuss the use of technology in a network support services environment. LA.C.3.4.

### NETWORK SUPPORT

**37.0 PROVIDE NETWORK SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH DIRECT CONTACT REMOTE ACCESS**—The student will be able to:

37.01 Apply appropriate diagnostic techniques to solve network problems.

37.12 Perform local network support using various troubleshooting and diagnostic techniques.

37.03 Perform remote network support using various remote access methods.

**60.0 DEVELOP ELECTRONIC COMMUNICATIONS SKILLS**—The student will be able to:

60.03 Exhibit proficiency in using Internet services.

60.05 Exhibit proficiency in downloading and uploading Internet information.

60.06 Perform web-based research to solve specific network problems.

**61.0 PERFORM LOGICAL AND PHYSICAL NETWORK DESIGN ACTIVITIES**—The student will be able to:

61.01 Describe the various LAN communication problems.

61.02 Describe the effects of LAN segmentation with bridges, routers, and switches.

61.03 Describe the operation, characteristics and benefits of VLANs.

61.04 Explain and identify LAN design goals, issues, and methodology.

61.05 Demonstrate the ability to analyze equipment necessary to meet specific design requirement.

61.06 Demonstrate the ability to create physical and logical network implementation documentation.

**62.0 DEMONSTRATE PROFICIENCY IN SELECTING APPROPRIATE VARIOUS ROUTING PROTOCOLS AND IP ROUTING CONFIGURATION FOR VARIOUS NETWORK DESIGNS**—The student will be able to:

62.01 Describe the two parts of network addressing, and then identify the parts in specific protocol address examples.

62.02 Create the different classes of IP addresses [and sub netting].

62.03 Configure IP addresses.

62.04 Verify IP addresses.

## Network Support Services

- 62.05 Identify the functions of the TCP/IP transport-layer protocols.
  - 62.06 Identify the functions of the TCP/IP network-layer protocols.
  - 62.07 Identify the functions performed by ICMP.
  - 62.08 Configure IPX access lists and SAP filters to control traffic.
  - 62.09 Explain the services of separate and integrated multi-protocol routing.
  - 62.10 List problems that each routing type encounters when dealing with topology changes and describe techniques to reduce the number of these problems.
- 63.0 DEMONSTRATE PROFICIENCY IN USING NETWORK TRAFFIC FILTERING TO IMPROVE NETWORK PERFORMANCE AND PROVIDE BASIC LEVELS OF SECURITY**—The student will be able to:
- 63.01 Define and describe the purpose and operation of network traffic filtering.
  - 63.02 Demonstrate proficiency in using configuration and interface perform commands to and monitor network traffic filtering.
- 64.0 PERFORM NETWORK MANAGEMENT ACTIVITIES RELATED TO DOCUMENTATION, SECURITY, PERFORMANCE, ADMINISTRATION, TROUBLESHOOTING AND COPING WITH ENVIRONMENTAL FACTORS**—The student will be able to:
- 64.01 Perform documentation activities for networks, such as logs, journals, diagrams, labeling schemes, layouts, software listings, user policy, security policy.
  - 64.02 Plan network security measures by establishing security policies and procedures, including user policies, authentication procedures, back-up and data recovery procedures, and redundancy techniques.
  - 64.03 Demonstrate proficiency in using network monitoring software.
  - 64.04 Explain the procedures necessary to monitor, create benchmarks, and plan for improvement of network performance.
  - 64.05 Explain the administrative side of network management, including physical and logical boundaries, costs, error report documentation and the management of human resources.
- 65.0 IDENTIFY AND DESCRIBE VARIOUS WAN FUNCTIONS, DEVICES, AND DEMONSTRATE UNDERSTANDING OF THE WAN DESIGN PROCESS**—The student will be able to:
- 65.01 Describe the functions of private addressing and be able to explain the major features of and configure NAT, PAT, and DHCP.
  - 65.02 Describe the major features of WAN technology, including, devices, standards, encapsulation, link options, and packet and circuit switching.
  - 65.03 Perform WAN design activities that require using the necessary steps in WAN design, the three-layered design model, and various other design models.
- 66.0 DESCRIBE THE OPERATION AND IMPLEMENTATION OF VIRTUAL PRIVATE NETWORKS**—The student will be able to:
- 66.01 Describe the virtual private network operation.
  - 66.02 Describe the virtual private network implementation.
  - 66.03 Demonstrate an understanding of tunneling.
  - 66.04 Describe the end-to-end virtual dialup process.

### OCCUPATIONAL COMPLETION POINT - DATA CODE E

SENIOR NETWORK ADMINISTRATOR - DOT 031.132-010 SOC Code 15-1071

## Network Support Services

Intended outcomes of OCP A, OCP B, OCP C, and OCP D must be completed previously.

### WORK-BASED LEARNING

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES - The student will be able to:

20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4

20.30 Discuss the use of technology in a network support services environment. LA.C.3.4

### NETWORK/SOFTWARE SUPPORT

70.0 COMPARE AND CONTRAST HIERARCHICAL NETWORK DESIGN MODELS AND SCALABLE INTERNETWORKS-the student will be able to:

70.01 Show proficiency in the use of the three-layer hierarchical design model.

70.02 Describe router functions in the core layer, distribution layer, and access layer.

70.03 Describe key characteristics of making the network reliable, available, responsive, efficient, adaptable, accessible, scalable and secure.

70.04 Compare and contrast Equal-Cost load balancing with RIP and Unequal-Cost load balancing with IGRP.

71.0 DISCUSS ADVANCED IP ADDRESSING MANAGEMENT-the student will be able to:

71.01 Describe and explain IPv4 addressing, Internet's address architecture, classes of IP addresses, and perform subnet masking.

71.02 Understand and explain Classless Interdomain Routing (CIDR), route aggregation, supernetting and address allocation.

71.03 Discuss and explain Variable-Length Subnet Masks along with classless and classful routing protocols.

71.04 Compare and contrast route summarization and route flapping.

71.05 Describe and discuss Network Address Translation (NAT), private addressing with NAT, private IP addresses (RFC 1918) and discontinuous subnets.

71.06 Use IP unnumbered and DHCP operations

71.07 Configure IOS DHCP server, Easy IP and IP helper addresses

71.08 Discuss IP addressing crisis and solutions with IPv6 address formats.

71.09 Configure IP unnumbered in a lab setting.

72.0 DEMONSTRATE PROFICIENCY IN BASIC ROUTER CONFIGURATION-the student will be able to:

72.01 Build 'Start.TXT', capture hyperterminal and telnet sessions, create access control list and extended pings, and configure VLSM using routing fundamentals.

72.02 Configure static routing and dynamic routing using distance-vector routing protocols, link-state routing protocols, and hybrid routing.

72.03 Configure static default routes and default routing with IGRP using default route caveats and floating static routes

## Network Support Services

- 73.04 Describe and explain convergence issues and route calculation fundamentals.
- 72.05 Start routing process using various configurations, initiate routing updates and routing metrics.
- 72.06 Show proficiency in migrating from RIP to EIGRP.
- 72.07 Configuring default routing with RIP and IGRP, configuring floating static routes.

### **73.0 DEMONSTRATE PROFICIENCY IN THE USE OF OSPF**-The student will be able to:

- 73.01 Discuss issues addressed by the use OSPF, list and define OSPF terminology, list OSPF states and OSPF network types, describe OSPF Hello protocol and Steps of OSPF operation.
- 73.02 Establish router adjacencies, elect a DR and a BDR, and discover routes.
- 73.03 Select appropriate routes and maintain routing information configuring OSPF on routers within a single area.
- 73.04 Use optional configuration commands and configure OSPF over NBMA in a lab setting.
- 73.05 Describe Full-Mesh Frame Relay, Partial-Mesh Frame Relay, Point-to-Multipoint OSPF.

### **74.0 UNDERSTAND AND DISCUSS MULTIAREA OSPF OPERATION AND CONFIGURATION**-The student will be able to:

- 74.01 Configure OSPF, examining the DR/BDR election process
- 74.02 Configure Point-to-Multipoint OSPF over frame relay, create multiple OSPF areas, use OSPF router types, and incorporate OSPF LSA and area types.
- 74.03 Configuring OSPF operation across multiple areas and flooding LSUs to multiple areas, updating the routing table
- 74.04 Configure Multiarea OSPF, using and configuring OSPF multiarea components, and configuring OSPF route summarization.
- 74.05 Verify OSPF operation, show commands, clear and debug commands.

### **75.0 DEMONSTRATE THE USE OF STUB AND TOTALLY STUBBY AREAS**-The student will be able to:

- 75.01 Use stub and totally stubby areas.
- 75.02 Set up stub and totally stub area criteria.
- 75.03 Configure stub and totally stubby areas.
- 75.04 Set up a OSPF stub area configuration example.
- 75.05 Set up a OSPF totally stubby configuration example.
- 75.06 Monitor multiarea OSPF, verifying multiarea OSPF operation
- 75.07 Create a multiarea OSPF.

### **76.0 CONFIGURE AND DEFINE VIRTUAL LINKS**-The student will be able to:

- 76.01 Meet the backbone area requirements.
- 76.02 Configure virtual links.
- 76.03 Set up a virtual link configuration example.
- 76.04 Show not-so-stubby areas.
- 76.05 Demonstrate how NSSA operates.
- 76.06 Configure a stub area and a totally stubby area.
- 76.07 Configure an NSSA and configure virtual links.

### **77.0 DEMONSTRATE PROFICIENCY IN THE USE OF EIGRP**-The student will be able to:

## Network Support Services

- 77.01 Define and explain EIGRP fundamentals, features, components, operations.
- 77.02 Configure and monitor EIGRP in lab exercise.

**78.0 DEMONSTRATE PROFICIENCY IN ROUTE OPTIMIZATION**-The student will be able to:

- 78.01 Show how to control routing updates, policy routing, and route redistribution.
- 78.02 Create a route optimization configuration in lab setting.

**79.0 DEMONSTRATE PROFICIENCY IN THE USE OF BGP**-The student will be able to:

- 79.01 Define and explain autonomous systems and basic BGP operations.
- 79.02 Configure and monitor BGP operations and routing process.
- 79.03 Define and explain BGP attributes and the BGP decision process.
- 79.04 Create BGP configuration in lab setting.
- 79.05 Develop a scaling BGP and route reflectors.
- 79.06 Set up BGP route filtering and policy routing.
- 79.07 Explain the community attribute and peer groups.
- 79.08 Explain redundancy, symmetry, and load balancing.
- 79.09 Define and explain BGP redistribution.
- 79.10 Perform scaling BGP lab exercises and configure BGP in a lab setting.

**80.0 DEFINE AND SHOW PROFICIENCY IN SECURITY**-The student will be able to:

- 80.01 Show proficiency in securing router access using access lists.
- 80.02 Show proficiency in using dynamic access lists using lock-and-key.
- 80.03 Show proficiency in session filtering.
- 80.04 Define and explain context-based access control.
- 80.05 Use an alternative to access lists.
- 80.06 Configure router security in a lab setting.

**81.0 USING LAB EQUIPMENT, DEMONSTRATE THE SETUP, CONFIGURATION, CONNECTIVITY OF ROUTERS TO CREATE A SMALL WAN**-The student will be able to:

- 81.01 Demonstrate the use of remote access.
- 81.02 Select appropriate WAN technologies for different scenarios.
- 81.03 Select remote access solutions for different technologies.
- 81.04 Assemble and Cable WAN components.

**82.0 SHOW THE PROCESS OF USING MODEMS AND ASYNCHRONOUS DIALUP CONNECTIONS**-The student will be able to:

- 82.01 List, describe and verify modem functions.
- 82.02 Configure asynchronous interfaces and terminal lines.
- 82.03 Demonstrate proficiency in the creation of modem configurations.
- 82.04 Configuring a Windows PC dialup connection.
- 82.05 Use dialup connection configurations.

**83.0 CONFIGURE AND VERIFY PPP CONFIGURATIONS**-The student will be able to:

## Network Support Services

- 83.01 Demonstrate the use of PPP authentication, PPP callback, PPP compression, and PPP multilink.
- 83.02 Create and verifying PPP configurations.

### 84.0 CONFIGURE AND MONITOR ISDN AND DDR-The student will be able to:

- 84.01 Explain and discuss ISDN architecture and ISDN protocol layers.
- 84.02 Configure ISDN BRI Dial-on-Demand, static routing and default routing, and ISDN PRI.
- 84.03 Create optional configurations.
- 84.04 Monitor the ISDN interface.
- 84.05 Create ISDN configurations.

### 85.0 CONFIGURE DIALER PROFILES-The student will be able to:

- 85.01 Demonstrate the use of Legacy DDR.
- 85.02 Create and use various dialer profiles.
- 85.03 Verify and monitor dialer profiles configurations.

### 86.0 CREATE AND TROUBLE-SHOOT X.25 CONFIGURATIONS-The student will be able to:

- 86.01 Show proficiency in the use of X.25 concepts.
- 86.02 Configure and Trouble-shoot X.25.

### 87.0 CONFIGURE AND TROUBLE-SHOOT FRAME RELAY-The student will be able to:

- 87.01 Show proficiency using frame relay concepts.
- 87.02 Configure frame relay.
- 87.03 Create various frame relay topologies and configurations.
- 87.04 Demonstrate proficiency managing frame relay traffic.
- 87.05 Show the process of frame relay traffic shaping.
- 87.06 Create on demand routing using frame relay.
- 87.07 Trouble-shoot frame relay traffic configurations.

### 88.0 DEMONSTRATE THE USE OF WAN BACKUP AND DIAL BACKUP-The student will be able to:

- 88.01 Demonstrate dial backup.
- 88.02 Demonstrate backup interface operations.
- 88.03 Demonstrate routing with the load backup feature.
- 88.04 Verifying dial backup configurations in a lab setting.
- 88.05 Create various WAN backup configurations in a lab setting.

### 89.0 DEMONSTRATE THE USE OF QUEUING AND COMPRESSION TECHNIQUES-The student will be able to:

- 89.01 Demonstrate proficiency using various queuing options.
- 89.02 Demonstrate proficiency optimizing traffic flow with data compression.

### 90.0 DEMONSTRATE THE USE OF SCALING IP ADDRESSES WITH NAT-The student will be able to:

- 90.01 Define and explain NAT concepts and terminology.
- 90.02 Demonstrate proficiency in configuring, creating and verifying NAT configurations in lab setting.

## Network Support Services

**91.0 DEMONSTRATE PROFICIENCY USING AAA TO SCALE ACCESS CONTROL**-The student will be able to:

- 91.01 List and define AAA concepts and terminology.
- 91.02 Demonstrate proficiency configuring AAA.
- 91.03 Perform lab exercises using access control configurations.

**92.0 DISCUSS AND EXPLAIN EMERGING REMOTE-ACCESS TECHNOLOGIES**-The student will be able to:

- 92.01 List and define features and capabilities of cable, modems wireless, network access, multichannel multipoint distribution services, local multipoint distribution services, wireless local area networking, very-high-data-rate digital subscriber line (VDSL).

**93.0 DEMONSTRATE PROFICIENCY CONFIGURING A 700 SERIES ROUTER**-The student will be able to:

- 93.01 Use a series router.
- 93.02 Configure the 700 Series router in a lab setting.
- 93.03 Use various IOS configurations in a lab setting.

**94.0 UNDERSTAND AND DESCRIBE KEY CHARACTERISTICS OF VARIOUS SWITCHING TECHNOLOGIES, LAN SWITCHING AND THE HIERARCHICAL MODEL OF NETWORK DESIGN, AND THE BUILDING-BLOCK APPROACH**-The student will be able to:

- 94.01 Discuss the requirements of the evolving campus structure and the issues with traditional network designs.
- 94.02 Describe the fundamental campus elements and contributing variables to campus networks.
- 94.03 Compare and contrast the traditional 80/20 rule of network traffic and the new 20/80 rule of network traffic.
- 94.04 Discuss switching and the OSI model, layer 2, 3, and 4 switching, and multiplayer switching.
- 94.05 Discuss the core layer, the distribution layer, and the access layer in relation to switching.
- 04.06 List and describe the advantages and disadvantages of the building-block approach, scaling the switch block, building the core block and layer 2 and 3 backbone scaling.

**95.0 UNDERSTAND AND DESCRIBE CAMPUS NETWORKS, DESIGN MODELS, AND SWITCHING TECHNOLOGIES**-The student will be able to:

- 95.01 List and explain key characteristics of various switching technologies.
- 95.02 Discuss LAN switching and the hierarchical model of network design.
- 95.03 Show proficiency using the building-block approach to networking.

**96.0 LIST AND DESCRIBE VARIOUS TYPES OF LAN MEDIA**-The student will be able to:

- 96.01 Show proficiency using modem functions and maintaining modem auto-configurations.
- 96.02 Create configurations for asynchronous connections.

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96.03 Create various modem configurations.

**97.0 SHOW PROFICIENCY CONFIGURING A SWITCH**-The student will be able to:

97.01 Demonstrate the process for initial connectivity to a switch.

97.02 Show proficiency creating the basic configuration of a switch.

97.03 List and explain important IOS features.

**98.0 DEMONSTRATE PROFICIENCY CONFIGURING VLANS**-The student will be able to:

98.01 Understand and explain VLANs.

98.02 Discuss VLAN basics and VLAN types.

98.03 Configure a VLAN in a lab setting.

98.04 Show use of VLAN identification techniques and VLAN trunking protocol.

98.05 Create VTP configuration and use VTP pruning.

**99.0 UNDERSTAND AND EXPLAIN SPANNING TREE PROTOCOL (STP) AND REDUNDANT LINKS**-The student will be able to:

99.01 Discuss Basic STP Operations and STP Processes.

99.02 Compare and contrast VLANs and STP.

99.03 Show how STP is used in the Campus Network.

99.04 Demonstrate the resolution of Redundant Links

**100.0 DEMONSTRATE PROFICIENCY ROUTING BETWEEN VLANS**-The student will be able to:

100.01 Understand and discuss VLAN issues.

100.02 Route switch modules.

100.03 Show proficiency using external routers in a lab setting.

**101.0 DEMONSTRATE PROFICIENCY WITH MULTILAYER SWITCHING**-The student will be able to:

101.01 Define and explain MLS Processes.

101.02 Create basic MLS configurations.

101.03 Show proficiency using flow masks.

101.04 Show how to use MLS on the switch.

**102.0 DEMONSTRATE THE USE OF HOT STANDBY ROUTING PROTOCOL (HSRP)**-The student will be able to:

102.01 Define and explain HSRP operations.

102.02 Create HSRP configurations in a lab setting.

**103.0 UNDERSTAND AND USE IGMP AND MULTICASTING** - the student will be able to:

103.01 Define and explain multicasting.

103.02 Understand and discuss IGMP.

103.03 Show proficiency routing multicast traffic.

103.04 Demonstrate proficiency using multicast routing protocols.

103.05 Configure IP multicast routing in a lab setting.

103.06 List and describe optional IP multicast routing tasks.

**104.0 DEMONSTRATE PROFICIENCY RESTRICTING NETWORK ACCESS**-The student will be able to:

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- 104.01 Show proficiency creating networking policies.
- 104.02 Discuss and explain basic network security techniques.
- 104.03 Demonstrate execution of policy configurations on a set of routers.

### **105.0 DEMONSTRATE PROFICIENCY USING NETWORK TROUBLESHOOTING TOOLS AND BASIC NETWORK MANAGEMENT DIAGNOSTIC TOOLS**-The student will be able to:

- 105.01 Explain and discuss troubleshooting methodologies and general problem-solving concepts.
- 105.02 List and define general considerations in troubleshooting.
- 105.03 Define and explain each component of the general problem-solving model.
- 105.04 Demonstrate proficiency using common management and diagnostic tools.
- 105.05 Show proficiency using network management software.
- 105.06 Demonstrate proficiency using router diagnostic commands.
- 105.07 Familiarize logging and error message formats.
- 105.08 Demonstrate proficiency interacting with technical **support**.

### **106.0 LIST AND DEFINE THE COMMONLY USED PROTOCOLS, ROUTING TECHNIQUES, AND SWITCHING PROCESSES** -The student will be able to:

- 106.01 List and define network services, layer 2 LAN protocols, and layer 2 WAN protocols.
- 106.02 race packets through a router.
- 106.03 Define and explain packet switching paths.
- 106.04 Identify performance issues affecting packet switching.
- 106.05 Define and explain low-level troubleshooting.

### **107.0 DEMONSTRATE PROFICIENCY TROUBLESHOOTING TCP/IP, LAN SWITCH ENVIRONMENT, VLANS, FRAME RELAY, AND ISDN**-The student will be able to:

- 107.01 List, define, and explain theory, concepts, and terminology of TCP/IP, LAN switch environment, spanning tree, VLANs, frame relay, and ISDN.
- 107.02 List, define, and explain common problems with TCP/IP, LAN switching, and ISDN.
- 107.03 List, define, and explain common scenarios with VLANs, frame relay, and ISDN.
- 107.04 Troubleshoot TCP/IP in a Windows environment; use LAN switch troubleshooting tools, explain general VLAN troubleshooting issues; list and explain the steps in frame relay troubleshooting and ISDN problem isolation.
- 107.05 Use show commands to verify LAN switch configuration settings.
- 107.06 Use show and debug commands for TCP/IP, router VLANs, frame relay, and ISDN.
- 107.07 Use TCP/IP diagnostic tools.

### **108.0 DEMONSTRATE PROFICIENCY CONFIGURING AND TROUBLE SHOOTING IPX AND APPLE TALK** -The student will be able to:

- 108.01 List, define, and explain theory, concepts, and terminology of IPX and AppleTalk.
- 108.02 Demonstrate proficiency configuring IPX and AppleTalk.
- 108.03 Demonstrate proficiency trouble shooting IPX and AppleTalk.

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108.04 Demonstrate proficiency using show and debug command with IPX and AppleTalk.

**109.0 Demonstrate proficiency troubleshooting EIGRP, OSPF, and BGP**—The student will be able to:

- 109.01 List, define, and explain theory, concepts, and terminology of EIGRP, OSPF, and BGP.
- 109.02 Demonstrate proficiency configuring AAA, EIGRP, OSPF, and BGP.
- 109.03 Demonstrate proficiency trouble shooting EIGRP, OSPF, and BGP.
- 109.04 Demonstrate proficiency using the show and debug commands for OSPF and BGP.

### **OCCUPATIONAL COMPLETION POINT - DATA CODE F**

WIRELESS NETWORK ADMINISTRATOR SOC Code 15-1080

Intended outcomes of OCP a, OCP B, OCP C, OCP D, and OCP E must be completed previously.

### **WORK-BASED LEARNING**

**20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES** —The student will be able to:

- 20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4
- 20.30 Discuss the use of technology in a network support services environment. LA.C.3.4
- 20.32 Discuss the management/supervisory skills needed in a network support service environment.

**120.0 DEMONSTRATE PROFICIENCY IN APPLYING RADIO FREQUENCY (RF) TECHNOLOGIES**—The student will be able to:

- 120.01 Define and apply the basic concepts of RF behavior.
- 120.02 Understand the applications of basic RF antenna concepts.
- 120.03 Understand and apply the basic components of RF
- 120.04 Identify some of the different uses for spread spectrum technologies.
- 120.05 Comprehend the differences between, and apply the different types of spread spectrum technologies.
- 120.06 Identify and apply the concepts which make up the functionality of spread spectrum technology.
- 120.07 Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.

**121.0 DEVELOP AN AWARENESS OF WIRELESS LAN TECHNOLOGIES**—The student will be able to:

- 121.01 Identify and apply the processes involved in authentication and association.
- 121.02 Recognize the concepts associated with wireless LAN service sets.
- 121.03 Understand the implications of the following power management features of wireless LANs.
- 121.04 Specify the modes of operation involved in the movement of data traffic across wireless LANs.

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**122.0 PERFORM IMPLEMENTATION AND MANAGEMENT ACTIVITIES**—The student will be able to:

- 122.01 Identify the technology roles for which wireless LAN technology is an appropriate technology application.
- 122.02 Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
- 122.03 Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.
- 122.04 Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.
- 122.05 Identify the basic attributes, purpose, and function of types of antennas.
- 122.06 Describe the proper locations and methods for installing antennas.
- 122.07 Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
- 122.08 Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
- 122.09 Identify, understand, correct or compensate for wireless LAN implementation challenges.
- 122.10 Explain how antenna diversity compensates for multipath.
- 122.11 Identify and understand the importance and process of conducting a thorough site survey.
- 122.12 Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
- 122.13 Identify the necessary equipment involved in performing a site survey.
- 122.14 Understand the necessary procedures involved in performing a site survey.
- 122.15 Identify and understand site survey reporting procedures.

**123.0 DEVELOP AN AWARENESS OF WIRELESS SECURITY SYSTEMS**—The student will be able to:

- 123.01 Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques.
- 123.02 Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
- 123.03 Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
- 123.04 Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
- 123.05 Identify how and security precautions are used to secure a wireless LAN.

**124.0 DEMONSTRATE KNOWLEDGE OF WIRELESS INDUSTRY STANDARDS**—The student will be able to:

- 124.01 Identify, apply and comprehend the differences between wireless LAN standards.
- 124.02 Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
- 124.03 Identify the differences between the ISM and UNII bands.
- 124.04 Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.
- 124.05 Identify the basic characteristics of infrared wireless LANs.

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### OCCUPATIONAL COMPLETION POINT - DATA CODE G

DATA COMMUNICATIONS ANALYST SOC Code 15-1081

Intended outcomes of OCP A, OCP B, OCP C, OCP D, OCP E, and OCP F must be completed previously.

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES - The student will be able to:

20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4

20.30 Discuss the use of technology in a network support services environment. LA.C.3.4

20.32 Discuss the management/supervisors skills needed in a network support services environment.

130.0 DEMONSTRATE A KNOWLEDGE OF GENERAL SECURITY CONCEPTS—The student will be able to:

130.01 Describe access control.

130.02 Describe network authentication.

130.03 Understand the various types of network attacks (backdoors, DOS, spoofing, etc.)

130.04 Identify and modify non-essential services and protocols.

130.05 Identify malicious code (virus, worm, Trojan).

130.06 Configure system auditing, logging, and scanning as it relates to security procedures.

131.0 DEVELOP AN AWARENESS OF COMMUNICATION SECURITY CONCEPTS—The student will be able to:

131.05 Describe remote access protocols (VPN, RADIUS, L2TP, etc.).

131.06 Identify E-mail security concerns (hoaxes, spam, etc.).

131.07 Identify web (HTML) security concepts and designs (HTTP/S, IM, etc.).

131.08 Demonstrate an awareness of file transfer security concerns.

131.09 Describe and identify wireless networking security concerns and vulnerabilities.

132.0 DEVELOP AN AWARENESS OF NETWORK INFRASTRUCTURE SECURITY—The student will be able to:

132.16 Install and configure network firewalls.

132.17 Identify security concerns with various wiring media (copper, fiber).

132.18 Identify security concerns associated with removable media and storage devices.

132.19 Demonstrate an awareness of security topologies (security zones, Intranets, NAT, etc.).

132.20 Configure and use intrusion detection software.

132.21 Establish security baselines (updates, patches, hotfixes, Access Control lists, etc.).

132.22 Demonstrate the ability to configure a Virtual Private Network (VPN).

132.23 Describe the function of Network Address Translation (NAT).

133.0 DEVELOP AN AWARENESS OF CRYPTOGRAPHY AND ITS RELATION TO SECURITY—The student will be able to:

## Network Support Services

- 133.06 Demonstrate an understanding of security algorithms and encryption.
- 133.07 Use and apply Public Key Certificates.
- 133.08 Demonstrate an understanding of standards and protocols in commerce.

### **134.0 INCORPORATE ORGANIZATIONAL AND OPERATIONAL SECURITY IN AN APPROPRIATE AND EFFECTIVE MANNER**—The student will be able to:

- 134.06 Describe how to establish a network security policy.
- 134.07 Explain the importance of physical security to protect network resources.
- 134.08 Identify and use disaster recovery procedures.
- 134.09 Describe the importance of business continuity and its relationship to network and corporate security.
- 134.10 Describe security policies and procedures that would be used in a business environment.
- 134.11 Explain the importance of privilege management (access, password management, sign-on, etc.).
- 134.12 Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
- 134.13 Explain the importance of educating users and supervisors in regard to network security.
- 134.14 Create documentation that describes standards and guidelines for a network security system.

**Florida Department of Education  
STUDENT PERFORMANCE STANDARDS**

**Secondary Course Number:** 8209020  
**Course Title:** Computing for College and Careers  
**Course Credit:** 1

**COURSE DESCRIPTION:**

This course is designed to provide a basic overview of current business and information systems and trends and to introduce students to the basics and foundations required for today's business environments. Emphasis is placed on developing proficiency with touch keyboarding and fundamental computer applications, so that they may be used as communication tools for enhancing personal and work place proficiency in an information-based society. This also includes proficiency with computers using databases, spreadsheets, presentation applications, and the integration of these programs using software that meets industry standards. After successful completion of this core course, students will have met Occupational Completion Point - Data Code A, Information Technology Assistant, SOC Code 43- 4000.

**INFORMATION SYSTEMS**

02.0 DEMONSTRATE KNOWLEDGE, SKILL, AND APPLICATION OF INFORMATION SYSTEMS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 01.01 Develop keyboarding skills to enter and manipulate text and data. (LA.B.1.4.3)
- 01.02 Describe and use current and emerging computer technology and software to perform personal and business related tasks. (LA.B.2.4.4)
- 01.03 Identify and describe communications and networking systems used in workplace environments.
- 01.04 Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software. (LA.B.2.4.4, LA.A.2.4.6)
- 01.05 Demonstrate basic computer file management skills. (LA.A.2.4.2, LA.B.2.4.4, LA.B.2.4.6)
- 01.06 Troubleshoot problems with computer hardware peripherals and other office equipment. (LA.D.2.4.4)
- 01.07 Describe ethical issues and problems associated with computers and information systems.
- 01.08 Apply ergonomic principles applicable to the configuration of computer workstations.

**WORKPLACE COMMUNICATIONS**

02.0 DEMONSTRATE COMPREHENSION AND COMMUNICATION SKILLS-The student will be able to:

- 02.01 Read and comprehend technical and non-technical reading assignments related to course content including trade journals, books, magazines and electronic sources.
- 02.02 Write clear and well-organized research papers, integrating a variety of information.

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- 02.03 Prepare and deliver an oral report with appropriate materials to the class
- 02.04 Participate in large group discussions as a member and/or a leader.
- 02.05 Take notes, organize, summarize, and paraphrase ideas and details.
- 02.06 Accurately follow written and oral instructions.
- 02.07 Interpret data on graphs, charts, diagrams, and tables commonly used in this industry/occupation.

### 03.0 USE TECHNOLOGY TO ENHANCE THE EFFECTIVENESS OF COMMUNICATION SKILLS- The student will be able to:

- 03.01 Select and use word processing software and accompanying features to enhance written business communications.  
(LA.B.1.4.1)
- 03.02 Use the writing process to create and edit business documents appropriate to the subject matter, purpose, and audience.  
(LA.B.1.4.1, LA.B.1.4.2, LA.B.1.4.3)
- 03.03 Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.  
(LA.B.2.4.1, LA.B.2.4.2)
- 03.05 Use computer networks (e.g., Internet, on-line databases, e-mail) to facilitate collaborative or individual learning and communication.
- 03.06 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.

## MANAGEMENT

### 04.0 DEVELOP AN AWARENESS OF MANAGEMENT FUNCTIONS AND ORGANIZATIONAL STRUCTURES AS THEY RELATE TO TODAY'S WORKPLACE AND EMPLOYER/ EMPLOYEE ROLES-The student will be able to:

- 04.04 Explore, design, implement, and evaluate organizational structures and cultures for managing project teams.
- 04.05 Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.
- 04.06 Collaborate with individuals and teams to complete tasks and solve business-related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.

### 05.0 PRACTICE QUALITY PERFORMANCE IN THE LEARNING ENVIRONMENT AND THE WORKPLACE-The student will be able to:

- 05.03 Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).
- 05.04 Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).

### 06.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

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- 06.04 Demonstrate an awareness of quality service and the personal and professional standards required to establish an effective service-based culture in the workplace, business, or learning environment.
- 06.05 Identify, analyze, and implement managerial skills necessary for maintaining a high quality work environment, goals, and strategic planning in business settings.
- 06.06 Follow accepted rules, regulations, policies, procedures, processes, and workplace safety.

## MATHEMATICS AND FINANCE

- 07.0 APPLY MATHEMATICAL OPERATIONS AND PROCESSES AS WELL AS FINANCIAL PLANNING STRATEGIES TO COMMONLY OCCURRING SITUATIONS IN THE WORKPLACE TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:
  - 07.04 Analyze, interpret, compile, and demonstrate the ability to present/communicate data in understandable and measurable terms using common statistical procedures. (MA.E.1.4.1, MA.E.A.4.2)
  - 07.05 Use common standards of measurement including the metric system in solving work-related or business problems (e.g., length, weight, currency, time). (MA.B.3.4.1)
  - 07.06 Select and use the correct mathematical processes and tools to solve complex problem situations that are typical of business settings and use formulas when appropriate. (MA.A.3.4.3)

## JOB READINESS AND CAREER DEVELOPMENT

- 08.0 ASSESS PERSONAL STRENGTHS AND WEAKNESSES AS THEY RELATE TO JOB OBJECTIVES, CAREER EXPLORATION, PERSONAL DEVELOPMENT, AND LIFE GOALS-The student will be able to:
  - 08.01 Assess, analyze, and reassess individual talents, aptitudes, interests, and personal characteristics as they relate to potential future careers in business environments.
  - 08.02 Use personal assessment tools to identify personal strengths and weaknesses related to learning and work environments.
  - 08.03 Analyze job and career requirements and relate career interests to opportunities in the global economy.
- 09.0 INCORPORATE KNOWLEDGE GAINED FROM INDIVIDUAL ASSESSMENT AND JOB/CAREER EXPLORATION TO DESIGN AN INDIVIDUAL CAREER PLAN THAT REFLECTS THE TRANSITION FROM SCHOOL TO WORK, LIFELONG LEARNING, AND PERSONAL AND PROFESSIONAL GOALS-The student will be able to:
  - 09.08 Analyze personal skills and aptitudes in comparison with various business related job and career options.
  - 09.09 Use career resources to develop an information base that reflects local and global business related occupations and opportunities for continuing education and workplace experience.
  - 09.10 Demonstrate job-seeking skills required for entry-level employment (e.g., resume, application, interview, and follow-up). (IA.C.3.4.4)
  - 09.11 Design and initiate a plan to facilitate growth and skill development related to anticipated job requirements and career expectations.

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- 09.12 Refine and implement a plan to facilitate personal growth and skill development related to anticipated job requirements and career expectations.
- 09.13 Demonstrate an awareness of specific job requirements and career paths (e.g., requirements, characteristics needed) in business environments.
- 09.14 Demonstrate an awareness of the potential impact of local and global trends on career plans and life goals.
- 09.08 Build mentor relationships with local professionals in the industry.

## HUMAN RELATIONS/INTERPERSONAL SKILLS

- 10.0 DEMONSTRATE HUMAN RELATIONS/INTERPERSONAL SKILLS APPROPRIATE FOR THE WORKPLACE-The student will be able to:
  - 10.04 Accept constructive criticism. (SS.B.1.4.5)
  - 10.05 Apply appropriate strategies to manage and resolve conflicts in work situations. (LA.D.1.4.2, SS.B.1.4.5)
  - 10.06 Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, professional dress, etc.).

## ADMINISTRATIVE PROCEDURES

- 13.0 PERFORM FUNCTIONS AND RESPONSIBILITIES TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:
  - 13.02 Demonstrate knowledge of ethical behavior in a business environment (e.g., confidentiality of information, employee right to know, hiring practices, plagiarism, copyright violations, sexual harassment, mission statement, code of ethics, etc.).

## NETWORK/SOFTWARE SUPPORT

- 41.0 PERFORM E-MAIL ACTIVITIES-The student will be able to:
  - 41.01 Describe e-mail capabilities and functions.
  - 41.09 Use the Internet to perform e-mail activities.
- 42.0 DEMONSTRATE OPERATING SYSTEMS-The student will be able to:
  - 42.01 Identify operating system file naming conventions.
  - 42.10 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
  - 42.12 Demonstrate a working knowledge of standard file formats.
  - 42.14 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).

## INFORMATION TECHNOLOGY

- 67.0 DEVELOP AN AWARENESS OF EMERGING TECHNOLOGIES-The student will be able to:
  - 67.01 Compare and contrast various methods of evaluation for emerging technologies.

## **Network Support Services**

- 67.02 Demonstrate knowledge of the process of planning upgrades and changeovers.
- 67.03 Compare and contrast emerging technologies (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, etc.).

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Course Number: 8207310  
Course Title: Introduction to Information Technology  
Course Credit: 1

**COURSE DESCRIPTION:**

This course is designed to provide an introduction to information technology concepts and careers as well as the impact information technology has on the world, people, and industry and basic web design concepts. The content includes information technology career research; operating systems and software applications; electronic communications including e-mail and Internet services; basic web commands and design; and emerging technologies. After successful completion of Introduction to Information Technology, students will have met Occupational Completion Point - Data Code A, General Office - OES 55321, SOC Code 43-9061.

**INFORMATION SYSTEMS**

03.0 DEMONSTRATE KNOWLEDGE, SKILL, AND APPLICATION OF INFORMATION SYSTEMS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 01.01 Develop keyboarding skills to enter and manipulate text and data.
- 01.02 Describe and use current and emerging computer technology and software to perform personal and business related tasks.
- 01.03 Identify and describe communications and networking systems used in workplace environments.
- 01.04 Use reference materials such as on-line help, vendor bulletin boards, tutorials, and manuals available for application software.
- 01.05 Troubleshoot problems with computer hardware peripherals and other office equipment.
- 01.07 Describe ethical issues and problems associated with computers and information systems.

**WORKPLACE COMMUNICATIONS**

02.0 DEMONSTRATE COMPREHENSION AND COMMUNICATION SKILLS-The student will be able to:

- 02.03 Use listening, speaking, telecommunication and nonverbal skills and strategies to communicate effectively with supervisors, co-workers, and customers.
- 02.62 Organize ideas and communicate oral and written messages appropriate for information technology environments.
- 02.63 Collaborate with individuals and teams to complete tasks and solve information technology problems.
- 02.64 Identify, define, and discuss professional information technology terminology appropriate for internal and external communications in an information technology environment.
- 02.65 Apply the writing process to the creation of appropriate documents following designated business formats.
- 02.66 Demonstrate an awareness of project management concepts and

## Network Support Services

tools (e.g., timelines, deadlines, resource allocation, time management, delegation of tasks, collaboration, etc.).

03.0 USE TECHNOLOGY TO ENHANCE THE EFFECTIVENESS OF COMMUNICATION SKILLS-  
The student will be able to:

- 03.03 Use database, spreadsheet, presentation software, scheduling, and integrated software packages to enhance communication.
- 03.06 Respond to and utilize information derived from multiple sources (e.g., written documents, instructions, e-mail, voice mail) to solve business problems and complete business tasks.

## MANAGEMENT

04.0 DEVELOP AN AWARENESS OF MANAGEMENT FUNCTIONS AND ORGANIZATIONAL STRUCTURES AS THEY RELATE TO TODAY'S WORKPLACE AND EMPLOYER/ EMPLOYEE ROLES-The student will be able to:

- 04.01 Explore, design, implement, and evaluate organizational structures and cultures. Explore and demonstrate an awareness of current trends in business and the employee's role in maintaining productive business environments in today's global workplace.
- 04.02 Collaborate with individuals and teams to complete tasks and solve business-related problems and demonstrate initiative, courtesy, loyalty, honesty, cooperation, and punctuality as a team member.

05.0 PRACTICE QUALITY PERFORMANCE IN THE LEARNING ENVIRONMENT AND THE WORKPLACE-The student will be able to:

- 05.01 Assess personal, peer and group performance and identify and implement strategies for improvement (e.g., organizational skills, note taking/outlining, advance organizers, reasoning skills, problem-solving skills, and decision-making skills).
- 05.02 Develop criteria for assessing products and processes that incorporate effective business practices (e.g., time management, productivity, total quality management).

06.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

- 06.03 Demonstrate awareness of the following workplace essentials: Quality customer service; business ethics; confidentiality of information; copyright violations; accepted workplace rules, regulations, policies, procedures, processes, and workplace safety, and appropriate attire and grooming.

## MATHEMATICS AND FINANCE

07.0 APPLY MATHEMATICAL OPERATIONS AND PROCESSES AS WELL AS FINANCIAL PLANNING STRATEGIES TO COMMONLY OCCURRING SITUATIONS IN THE WORKPLACE TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

## Network Support Services

- 07.01 Analyze, interpret, compile, and demonstrate the ability to present/communicate data in understandable and measurable terms using common statistical procedures.
- 07.02 Use common standards of measurement including the metric system in solving work-related or business problems (e.g., length, weight, currency, time).
- 07.03 Select and use the correct mathematical processes and tools to solve complex problem situations that are typical of business settings and use formulas when appropriate.

## JOB READINESS AND CAREER DEVELOPMENT

- 08.0 ASSESS PERSONAL STRENGTHS AND WEAKNESSES AS THEY RELATE TO JOB OBJECTIVES, CAREER EXPLORATION, PERSONAL DEVELOPMENT, AND LIFE GOALS-The student will be able to:
  - 08.02 Use personal assessment tools to identify personal strengths and weaknesses related to learning and work environments.
  - 08.03 Analyze job and career requirements and relate career interests to opportunities in the global economy.
- 09.0 INCORPORATE KNOWLEDGE GAINED FROM INDIVIDUAL ASSESSMENT AND JOB/CAREER EXPLORATION TO DESIGN AN INDIVIDUAL CAREER PLAN THAT REFLECTS THE TRANSITION FROM SCHOOL TO WORK, LIFELONG LEARNING, AND PERSONAL AND PROFESSIONAL GOALS-The student will be able to:
  - 09.15 Research, compare, and contrast information technology career clusters (e.g., characteristics needed, skills required, education required, industry certifications, advantages and disadvantages of information technology careers, the need for information technology workers, etc.).
  - 09.16 Describe the variety of occupations and professions within the world of information technology including those where information technology is either in a primary focus or in a supportive role.
  - 09.17 Describe job requirements for the variety of occupations and professions within the global world of information technology.
  - 09.18 Analyze personal skills and aptitudes in comparison with information technology career opportunities.
  - 09.19 Refine and implement a plan to facilitate personal growth and skill development related to information technology career opportunities.
  - 09.20 Develop and maintain an electronic career portfolio, to include, but not limited to the Resume and Letter of Application.
- 10.0 DEMONSTRATE HUMAN RELATIONS/INTERPERSONAL SKILLS APPROPRIATE FOR THE WORKPLACE-The student will be able to:
  - 10.01 Accept constructive criticism.
  - 10.03 Demonstrate personal and interpersonal skills appropriate for the workplace (e.g., responsibility, dependability, punctuality, integrity, positive attitude, initiative, respect for self and others, professional dress, etc.).

## WORK-BASED LEARNING

- 20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES-The student will be able to:
  - 20.44 Participate in work-based learning experiences in an information technology environment.

## Network Support Services

20.46 Discuss the use of technology in an information technology environment.

### NETWORK/SOFTWARE SUPPORT

41.0 PERFORM E-MAIL ACTIVITIES—The student will be able to:

- 41.01 Describe e-mail capabilities and functions.
- 41.02 Identify components of an e-mail message.
- 41.03 Identify the components of an e-mail address.
- 41.04 Identify when to use different e-mail options.
- 41.05 Attach a file to an e-mail message.
- 41.06 Forward an e-mail message.
- 41.07 Use an address book.
- 41.08 Reply to an e-mail message.
- 41.09 Use the Internet to perform e-mail activities.
- 41.10 Identify the appropriate use of e-mail and demonstrate related e-mail etiquette.
- 41.12 Identify when to include information from an original e-mail message in a response.
- 41.13 Identify common problems associated with widespread use of e-mail.

42.0 DEMONSTRATE KNOWLEDGE OF DIFFERENT OPERATING SYSTEMS—The student will be able to:

- 42.01 Identify operating system file naming conventions.
- 42.10 Demonstrate proficiency with file management and structure (e.g., folder creation, file creation, backup, copy, delete, open, save).
- 42.12 Demonstrate a working knowledge of standard file formats.
- 42.14 Explain the history and purpose of various operating systems (e.g., DOS, Windows, Mac, and Unix/Linux).

### WEB DESIGN

55.0 DEMONSTRATE PROFICIENCY NAVIGATING THE INTERNET, INTRANET, AND THE WWW—The student will be able to:

- 55.01 Identify and describe Web terminology.
- 55.10 Demonstrate proficiency in using the basic features of GUI browsers (e.g., setting bookmarks, basic configurations, e-mail configurations, address book).
- 55.11 Define Universal Resource Locators (URLs) and associated protocols (e.g., .com, .org, .edu, .gov, .net, .mil).
- 55.14 Describe and observe Internet/Intranet ethics and copyright laws and regulatory control.
- 55.15 Trace the evolution of the Internet from its inception to the present and into the future.
- 55.16 Demonstrate proficiency using search engines (e.g., Yahoo!, Google, Northern Light, Lycos, Excite, etc.).
- 55.17 Demonstrate proficiency using various web tools (e.g., downloading of files, transfer of files, telnet, PDF, etc.).
- 55.18 Identify effective Boolean search strategies.

56.0 DEMONSTRATE PROFICIENCY USING HTML COMMANDS—The student will be able to:

- 56.01 Identify elements of a Web page.
- 56.02 Describe individual Web page layouts and content (e.g., writing for the Web, Web structure).

## Network Support Services

- 56.03 Define basic HTML terminology.
- 56.04 Analyze HTML source code developed by others.
- 56.05 Create Web pages using basic HTML tags (e.g., links, lists, character styles, text alignment, and tables).
- 56.06 Use storyboarding techniques for subsequent Web pages (e.g., linear, hierarchical).
- 56.08 Edit and test HTML documents for accuracy and validity.
- 56.17 Use basic functions of WYSIWYG editors.
- 56.18 Use basic functions of HTML, DHTML, and XML editors and converters.
- 56.19 Enhance web pages through the addition of images and graphics including animation.

### 57.0 DEMONSTRATE PROFICIENCY IN PAGE DESIGN APPLICABLE TO THE WWW-The student will be able to:

- 57.01 Develop an awareness of acceptable Web page design, including index pages in relation to the rest of the Web site.
- 57.02 Describe and apply color theory as it applies to Web page design (e.g., background and text color).
- 57.04 Access and digitize graphics through various resources (e.g., scanner, digital cameras, on-line graphics, clipart, CD ROMs).
- 57.05 Use image design software to create and edit images.
- 57.25 Demonstrate proficiency in publishing to the Internet.
- 57.26 Demonstrate proficiency in adding downloadable forms to web pages.
- 57.27 Explain the need for web-based applications.

### 63.0 DEMONSTRATE PROFICIENCY USING SPECIALIZED WEB DESIGN SOFTWARE-The student will be able to:

- 63.01 Compare and contrast various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).
- 63.02 Demonstrate use of various specialized web design software (e.g., Flash, Shockwave, GoLive, Director, etc.).

## INFORMATION TECHNOLOGY

### 64.0 DEVELOP AN AWARENESS OF THE INFORMATION TECHNOLOGY INDUSTRY-The student will be able to:

- 64.01 Explain how information technology impacts the operation and management of business and society.
- 64.04 Explain the emergence of e-commerce and e-government and the potential impact on business and society.
- 64.05 Explain the emergence of a paperless society.

### 65.0 DEVELOP AN AWARENESS OF MICROPROCESSORS AND DIGITAL COMPUTERS-The student will be able to:

- 65.01 Describe the evolution of the digital computer.
- 65.02 Explain the general architecture of a microcomputer system.
- 65.03 Explain the evolution of microprocessors.
- 65.04 Explain software hierarchy and its impact on microprocessors.
- 65.05 Explain the need for and use of peripherals.
- 65.06 Demonstrate proficiency using peripherals.
- 65.07 Identify the basic concepts of computer maintenance and upgrades.
- 65.08 Differentiate between diagnosing and troubleshooting.

## Network Support Services

- 66.0 DEVELOP AN AWARENESS OF PROGRAMMING LANGUAGES-The student will be able to:
- 66.01 Explain the history of programming languages.
  - 66.02 Explain the need for and use of compilers.
  - 66.03 Explain how compilers work.
  - 66.04 Identify the three types of programming design approaches (e.g., top-down, structured, and object-oriented).
- 67.0 DEVELOP AN AWARENESS OF EMERGING TECHNOLOGIES-The student will be able to:
- 67.01 Compare and contrast various methods of evaluation for emerging technologies.
  - 67.02 Demonstrate knowledge of the process of planning upgrades and changeovers.
  - 67.03 Compare and contrast emerging technologies and describe how they impact business in the global marketplace (e.g., wireless, wireless web, cell phones, portables/handhelds, smart appliances, home networks, peer-to-peer, etc.).
- 69.0 DEMONSTRATE AN UNDERSTANDING OF THE SEVEN LAYERS OF THE OPEN SYSTEMS INTERFACE (OSI) MODEL-The student will be able to:
- 69.01 Describe the evolution of OSI from its inception to the present and into the future.
  - 69.02 Explain the interrelations of the seven layers of the Open Systems Interface (OSI) as it relates to hardware and software.
  - 69.04 Identify types of networks and how they work.
  - 69.06 Identify the role of servers and clients on a network.
  - 69.07 Identify benefits and risks of networked computing.
  - 69.08 Identify the relationship between computer networks and other communications networks (i.e. telephone systems).
  - 69.09 Identify Intranets, Extranets and how they relate to the Internet.
  - 69.11 Demonstrate basic understanding of network administration.

## SOFTWARE APPLICATIONS

- 70.0 DEMONSTRATE PROFICIENCY USING COMMON SOFTWARE APPLICATIONS-The student will be able to:
- 70.01 Compare and contrast the appropriate use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).
  - 70.02 Demonstrate proficiency in the use of various software applications (e.g., word processing, desktop publishing, graphics design, web browser, e-mail, presentation, database, scheduling, financial management, Java applet, music, etc.).
- 71.0 DEMONSTRATE PROFICIENCY USING SPECIALIZED SOFTWARE APPLICATIONS-The student will be able to:
- 71.01 Compare and contrast the appropriate use of specialized software applications (e.g., (OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation process control, materials management, etc.).
  - 71.02 Demonstrate awareness of specialized software applications

## **Network Support Services**

(e.g., OLTP, Computer Aided Design, Computer Aided Manufacturing, 3D animation, process control, materials management, etc.)

71.06 Demonstrate the ability to incorporate digital sound.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207020  
Course Title: Networking 1  
Course Credit: 1

**COURSE DESCRIPTION:**

This course is designed to develop competencies needed for employment in network support positions. The content includes instruction in basic hardware configuration, hardware and software troubleshooting, operating systems, and computer networking. After successful completion of Networking 1 students will have met Occupational Completion Point - Data Code B, Computer Support Specialist. - SOC Code 15-1041

**MANAGEMENT**

08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

08.17 Develop strategies for resolving customer conflicts.

30.0 IDENTIFY, INSTALL, CONFIGURE, AND UPGRADE DESKTOP AND SERVER COMPUTER MODULES AND PERIPHERALS, FOLLOWING ESTABLISHED BASIC PROCEDURES FOR SYSTEM ASSEMBLY AND DISASSEMBLY OF FIELD REPLACEABLE MODULES-The student will be able to:

- 30.01 Identify and describe the functions of main processing boards (e.g., CPUs, RAM, ROM, bus architecture).
- 30.01 Identify and describe the functions of communication ports (e.g., serial and parallel ports).
- 30.03 Identify and describe the functions of peripheral devices (e.g., scanners, modems, hard drives, printers).
- 30.04 Identify and describe the components of portable systems (e.g., battery, LCD, AC adapter, PDAs).
- 30.05 Troubleshoot, install and upgrade computers and peripherals.
- 30.06 Perform system hardware setup Demonstrate an understanding of input/output devices.
- 30.07 Installation and configuration of applications software, hardware, and device drivers.
- 30.08 Demonstrate an understanding of the operation and purpose of hardware components.
- 30.09 Install operating system software.
- 30.10 Customize operating systems.
- 30.11 Install application software.
- 30.12 Perform storage formatting and preparation activities.
- 30.13 Identify data measurement (e.g., bits, bytes, kilobytes).
- 30.14 Install and Configure RAID.
- 30.15 Recognize and report on server room environmental issues (temperature, humidity/ESD/power surges, back-up).

31.0 DIAGNOSE AND TROUBLESHOOT COMMON MODULE PROBLEMS AND SYSTEM MALFUNCTIONS OF COMPUTER SOFTWARE, HARDWARE, PERIPHERALS, AND OTHER OFFICE EQUIPMENT-The student will be able to:

## Network Support Services

- 31.01 Troubleshoot a personal computer system
- 31.02 Identify configuration problems.
- 31.03 Identify software problems.
- 31.04 Identify hardware malfunctions.
- 31.05 Identify network malfunctions
- 31.06 Resolve computer error messages.
- 31.07 Understand and troubleshoot memory and cache systems.
- 31.08 Verify that drives are the appropriate type.
- 31.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.

### **32.0 IDENTIFY ISSUES, PROCEDURES AND DEVICES FOR PROTECTION WITHIN THE COMPUTING ENVIRONMENT, INCLUDING PEOPLE, HARDWARE AND THE SURROUNDING WORKSPACE**-The student will be able to:

- 32.01 Apply basic rules for hardware safety.
- 32.02 Demonstrate proficiency in basic preventative hardware maintenance.
- 32.03 Special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
- 32.04 Apply ergonomic principles applicable to the configuration of computer workstations.
- 32.05 Describe ethical issues and problems associated with computers and information systems.

### **33.0 IDENTIFY SPECIFIC TERMINOLOGY, FACTS, WAYS AND MEANS OF DEALING WITH CLASSIFICATIONS, CATEGORIES AND PRINCIPLES OF MOTHERBOARDS, PROCESSORS AND MEMORY IN DESKTOP AND SERVER COMPUTER SYSTEMS**-The student will be able to:

- 33.01 Identify EDO RAM ,DRAM, SRAM, RIMM, VRAM, SDRAM, and WRAM.
- 33.02 Identify memory banks, memory chips (8-bit, 16-bit, and 32-bit), SIMMS (Single In-line Memory Module), DIMMS (Dual In-line Memory Module), parity chips versus non-parity chips.
- 34.04 Identify printer parallel port, COM/serial port, floppy drive, hard drive, Memory, and Boot sequence.

### **34.0 DEMONSTRATE KNOWLEDGE OF BASIC TYPES OF PRINTERS, BASIC CONCEPTS, PRINTER COMPONENTS, HOW THEY WORK, HOW THEY PRINT ONTO A PAGE, PAPER PATH, CARE AND SERVICE TECHNIQUES, AND COMMON PROBLEMS**-The student will be able to:

- 34.01 Identify types of printers-Laser, Inkjet, Dot Matrix.
- 34.02 Identify care and service techniques and common problems with primary printer types.
- 34.03 Implement and manage printing on a network.

### **36.0 IDENTIFY AND DESCRIBE BASIC NETWORK CONCEPTS AND TERMINOLOGY, ABILITY TO DETERMINE WHETHER A COMPUTER IS NETWORKED, KNOWLEDGE OF PROCEDURES FOR SWAPPING AND CONFIGURING NETWORK INTERFACE CARDS, AND KNOWLEDGE OF THE RAMIFICATIONS OF REPAIRS WHEN A COMPUTER IS NETWORKED**-The student will be able to:

- 35.01 Define networking and describe the purpose of a network.
- 35.02 Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).

## Network Support Services

- 35.03 Describe the various types of network topologies.
- 35.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
- 35.05 Configure network and verify network connectivity.
- 35.06 Discuss the responsibilities of the network administrator (e.g., rights and responsibilities).
- 35.07 Develop user logon procedures.
- 35.08 Utilize network management infrastructures (e.g., network monitoring, alerting, security) to perform administrative tasks.
- 35.09 Identify common backup strategies and procedures.
- 35.10 Select and use appropriate electronic communications software and hardware for specific tasks.
- 35.11 Compare and contrast Internet software and protocols.
- 35.12 Diagnose and resolve electronic communications operational problems.
- 35.13 Design and implement directory tree structures.
- 35.14 Install services tools (SNMP, backup software)
- 35.15 Perform full backup and verify backup
- 35.16 Identify bottlenecks (e.g., processor, bus transfer, I/O, disk I/O, network I/O, memory).
- 35.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
- 35.18 Document and test disaster recovery plan regularly, and update as needed.

### **36.0 PERFORM END USER SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH TELEPHONE, E-MAIL, Internet, REMOTE ACCESS, OR DIRECT CONTACT**—The student will be able to:

- 36.01 Apply call center vocabulary.
- 36.02 Listen and input information simultaneously.
- 36.03 Apply first response assistance for minor repair work.

### **38.0 DEMONSTRATE PROFICIENCY USING GRAPHICAL USER INTERFACE (GUI) OPERATING SYSTEMS**—The student will be able to:

- 38.01 Identify parts of GUI windows.
- 38.02 Create and use icons.
- 38.03 Demonstrate proficiency in using menu systems.
- 38.04 Demonstrate proficiency in using pointing and selection devices.
- 38.05 Identify keyboard shortcuts and special function keys.
- 38.06 Demonstrate proficiency in manipulating windows.
- 38.07 Utilize help systems and hypertext links.
- 38.08 Create, organize, and maintain file system directories.
- 38.09 Organize desktop objects.
- 38.10 Run multiple applications.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207030  
Course Title: Networking 2, *Infrastructure*  
Course Credit: 1

**COURSE DESCRIPTION:**

This course focuses on understanding network terminology and protocols, local-area networks, wide-area networks, OSI models, cabling, cabling tools, routers, router programming, Ethernet, IP addressing and network standards.. After successful completion of Networking 1 and Networking 2 Infrastructure, students will have met Occupational Completion Point - Data Code A, B, and C, Information Technology Assistant, Computer Support Assistant, and Network Support Assistant - SOC CODE 15-1070

**MANAGEMENT**

08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

08.18 Develop diplomatic methods to communicate with customers.

**NETWORK/SOFTWARE SUPPORT**

37.0 PERFORM END USER SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH TELEPHONE, E-MAIL, REMOTE ACCESS, OR DIRECT CONTACT-The student will be able to:

37.09 Apply first response assistance for minor repair work.

40.0 UNDERSTAND, DESCRIBE, AND EXPLAIN INTERNET CONNECTIONS-The student will be able to:

40.01 Understand the physical connectivity necessary for a computer to connect to the Internet.

40.02 Recognize the primary components of a computer.

40.03 Install and troubleshoot network interface cards and/or modems.

40.04 Use basic testing procedures to test the Internet connection.

40.05 Demonstrate a basic understanding of the use of Web browsers and plug-ins.

41.0 DEFINE NETWORKING TERMINOLOGY-The student will be able to:

41.01 Explain the importance of bandwidth in networking.

41.02 Identify bps, kbps, Mbps, and Gbps as units of bandwidth.

41.03 Explain the difference between bandwidth and throughput.

41.04 Explain the development of the Open System Interconnection model(OSI).

41.05 List the advantages of a layered approach.

41.06 Identify each of the seven layers of the OSI model.

41.07 Identify the four layers of the TCP/IP model.

1.08 Describe the similarities and differences between the two models.

41.09 Briefly outline the history of networking.

## Network Support Services

- 41.10 Identify devices used in networking.
- 41.11 Understand the role of protocols in networking.
- 41.12 Define LAN, WAN, MAN, and SAN.
- 41.13 Explain VPNs and their advantages.
- 41.14 Describe the differences between intranets and extranets.

### 42.0 EXPLAIN HOW TO CONNECT COPPER MEDIA, OPTICAL MEDIA, AND WIRELESS

MEDIA—The student will be able to:

- 42.01 Discuss the electrical properties of matter.
- 42.02 Define voltage, resistance, impedance, current, and circuits.
- 42.03 Describe the specifications and performances of different types of cable.
- 42.04 Describe coaxial cable and its advantages and disadvantages over other types of cable.
- 42.05 Describe shielded twisted-pair (STP) cable and unshielded twisted-pair cable and its uses.
- 42.06 Describe (UTP) and their uses.
- 42.07 Discuss the characteristics of straight-through, crossover, and rollover cables and where each is used.
- 42.08 Explain the basics of fiber-optic cable.
- 42.09 Describe how fibers can guide light for long distances.
- 42.10 Describe multimode and single-mode fiber.
- 42.11 Describe how fiber is installed.
- 42.12 Describe the type of connectors and equipment used with fiber-optic cable.
- 42.13 Explain how fiber is tested to ensure that it will function properly.
- 42.14 Discuss safety issues dealing with fiber-optics.

### 43.0 PERFORM TASKS RELATED TO THE NETWORK CABLE TESTING AND CABLE MAKING

The student will be able to:

- 43.01 Differentiate between sine waves and square waves.
- 43.02 Define and calculate exponents and logarithms.
- 43.03 Define and calculate decibels.
- 43.04 Define basic terminology related to time, frequency, a noise.
- 43.05 Differentiate between digital bandwidth and analog bandwidth.
- 43.06 Compare and contrast noise levels on various types of cabling.
- 43.07 Define and describe the affects of attenuation and impedance mismatch.
- 43.08 Define crosstalk, near-end crosstalk, far-end crosstalk, and power sum near-end crosstalk.
- 43.09 Describe how crosstalk and twisted pairs help reduce noise.
- 43.10 Describe the ten copper cable tests defined in TIA/EIA-568-B.
- 43.11 Describe the difference between Category 5 and Category 6 cable.

### 44.0 DEFINE NETWORK TOPOLOGIES, DEVICES AND CONNECTIONS—The student will be able to perform tasks related to the following:

- 44.01 Identify characteristics of Ethernet networks.
- 44.02 Identify straight-through, crossover, and rollover cable
- 44.03 Describe the function, advantages, and disadvantages of repeaters, hubs, bridges, switches, and wireless network components.
- 44.04 Describe the function of peer-to-peer networks.
- 44.05 Describe the function, advantages, and disadvantages of client-server networks.

## Network Support Services

- 44.06 Describe and differentiate between serial, Integrated Services Digital Network (ISDN), digital subscriber line (DSL), and cable modem WAN connections.
- 44.07 Identify router serial ports and their cable and connectors.
- 44.08 Identify and describe the placement of equipment used in various WAN configurations.

### 45.0 DEFINE ETHERNET FUNDAMENTALS AND OPERATIONS-The student will be able to:

- 45.01 Describe the basics of Ethernet technology.
- 45.02 Explain naming rules of Ethernet technology.
- 45.03 Define how Ethernet and the OSI model interact.
- 45.04 Describe the Ethernet framing process and frame structure.
- 45.05 List Ethernet frame field names and purposes.
- 45.06 Identify the characteristics of CSMA/CD.
- 45.07 Describe the key aspects of Ethernet timing, interframe spacing and backoff time after a collision.
- 45.08 Define Ethernet errors and collisions.
- 45.09 Explain the concept of auto-negotiation in relation to speed and duplex.

### 46.0 DEFINE AND EXPLAIN THE FUNCTIONS OF BRIDGES AND SWITCHES-The student will be able to:

- 46.01 Define bridging and switching.
- 46.02 Define and describe the content-addressable memory (CAM) table.
- 46.03 Define latency.
- 46.04 Describe store-and forward and cut-through switching modes.
- 46.05 Explain Spanning-Tree Protocol (STP).
- 46.06 Define collisions, broadcasts, collision domains, and broadcast domains.
- 46.07 Identify the Layer 1, 2, and 3 devices used to create collision domains and broadcast domains.
- 46.08 Discuss data flow and problems with broadcasts.
- 46.09 Explain network segmentation and list the devices used to create segments.

### 47.0 EXPLAIN THE MATHEMATICAL CONCEPTS AND PROTOCOLS BEHIND THE INTERNET-The student will be able to:

- 47.01 Explain why the Internet was developed and how TCP/IP fits the design of the Internet.
- 47.02 List the four layers of the TCP/IP model.
- 47.03 Describe the functions of each layer of the TCP/IP model.
- 47.04 Compare the OSI model and the TCP/IP model.
- 47.05 Describe the function and structure of IP addresses.
- 47.06 Understand why subnetting is necessary.
- 47.07 Explain the difference between public and private addressing.
- 47.08 Understand the function of reserved IP addresses.
- 47.09 Explain the use of static and dynamic addressing for a device.
- 47.10 Understand how dynamic addressing can be done using RARP, BootP and DHCP.
- 47.11 Use ARP to obtain the MAC address to send a packet to another device.
- 47.12 Understand the issues related to addressing between networks.

## Network Support Services

### 48.0 DEFINE AND EXPLAIN THE DIFFERENCE BETWEEN ROUTED AND ROUTING PROTOCOLS-The student will be able to:

- 48.01 Describe routed (routable) protocols.
- 48.02 List the steps of data encapsulation in an internetwork as data is routed to one or more Layer 3 devices.
- 48.03 Describe connectionless and connection-oriented delivery.
- 48.04 Name the IP packet fields.
- 48.05 Describe process of routing.
- 48.06 Compare and contrast different types of routing protocols.
- 48.07 List and describe several metrics used by routing protocols.
- 48.08 List several uses for subnetting.
- 48.09 Determine the subnet mask for a given situation.
- 48.10 Use a subnet mask to determine the subnet ID.

### 49.0 RECOGNIZE, DEFINE, AND EXPLAIN FUNCTIONS OF THE TRANSPORT LAYER-The student will be able to:

- 49.01 Describe the functions of the TCP/IP transport layer.
- 49.02 Describe flow control.
- 49.03 Describe the processes of establishing a connection between peer systems.
- 49.04 Describe windowing.
- 49.05 Describe acknowledgment.
- 49.06 Identify and describe transport layer protocols.
- 49.07 Describe TCP and UDP header formats.
- 49.08 Describe TCP and UDP port numbers and ports used for services and clients.
- 49.09 List the major protocols of the TCP/IP application layer.
- 49.10 Provide a brief description of the features and operation of well-known TCP/IP applications.
- 49.11 Describe TCP and UDP with its function.
- 49.12 Describe TCP synchronization and flow control.
- 49.13 Describe multiple conversations between hosts.
- 49.14 Understand the differences and the relationship between MAC addresses, IP addresses, and port numbers.

### 50.0 EXPLAIN, DEFINE, AND IDENTIFY THE COMPONENTS OF A WAN AND ROUTER-The student will be able to:

- 50.01 Identify organizations responsible for WAN standards.
- 50.02 Explain the difference between a WAN and LAN and the type of addresses each uses.
- 50.03 Describe the role of a router in a WAN.
- 50.04 Identify internal components of the router and describe their functions.
- 50.05 Describe the physical characteristics of the router.
- 50.06 Identify common ports on a router.
- 50.07 Properly connect FastEthernet, serial WAN, and console ports.

### 51.0 DESCRIBE AND IDENTIFY AN OPERATING SYSTEM FOR A ROUTER-The student will be able to:

- 51.01 Describe the purpose of the IOS.
- 51.02 Describe the basic operation of the IOS.
- 51.03 Identify various IOS features.
- 51.04 Identify the methods to establish a CLI session with the router.
- 51.05 Move between the user EXEC and privileged EXEC modes.
- 51.06 Establish a HyperTerminal session on a router.

## Network Support Services

- 51.07 Log into a router.
- 51.08 Use the help feature in the command line interface.
- 51.09 Troubleshoot command errors.
- 51.10 Name a router.
- 51.11 Set passwords.
- 51.12 Examine show commands.
- 51.13 Configure a serial interface.
- 51.14 Configure an Ethernet interface.
- 51.15 Execute changes to a router.
- 51.16 Save changes to a router.
- 51.17 Configure an interface description.
- 51.18 Configure a message-of-the-day banner.
- 51.19 Configure host tables.
- 51.20 Understand the importance of backups and documentation.

### 52.0 EXPLAIN HOW TO ESTABLISH CONNECTIONS BETWEEN NEIGHBORING ROUTERS-The student will be able to:

- 52.01 Enable and disable Protocols.
- 52.02 Determine which neighboring devices are connected to which local interfaces.
- 52.03 Gather network address information about neighboring devices using CDP.
- 52.04 Establish, Verify, Disconnect, Suspend a Telnet connection.
- 52.05 Perform alternative connectivity tests.
- 52.06 Troubleshoot remote terminal connections.

### 53.0 IDENTIFY AND EXPLAIN THE ROUTER BOOT SEQUENCE AND FILE SYSTEM-The student will be able to:

- 53.01 Identify the stages of the router boot sequence.
- 53.02 Determine how a router locates and loads its operating system.
- 53.03 Use the boot system command.
- 53.04 Identify the configuration register values.
- 53.05 Briefly describe the files used by the Router IOS and their functions.
- 53.06 List the locations on the router of the different file types.
- 53.07 Briefly describe the parts of the IOS name.
- 53.08 Save and restore configuration files using TFTP and copy-and paste.
- 53.09 Load an IOS image using TFTP.
- 53.10 Load an IOS image using XModem.
- 53.11 Verify the file system using show commands.

### 54.0 IDENTIFY AND EXPLAIN STATIC AND DYNAMIC ROUTING PROTOCOLS-The student will be able to:

- 54.01 Explain the significance of static routing.
- 54.02 Configure static and default routes.
- 54.03 Verify and troubleshoot static and default routes.
- 54.04 Identify the classes of routing protocols.
- 54.05 Identify distance vector routing protocols.
- 54.06 Identify link-state routing protocols.
- 54.07 Describe the basic characteristics of common routing protocols.
- 54.08 Identify interior gateway protocols.
- 54.09 Identify exterior gateway protocols.
- 54.10 Enable Routing Information Protocol (RIP) on a router.

## Network Support Services

- 55.0 **DESCRIBE AND CONFIGURE DISTANCE VECTOR PROTOCOLS**-The student will be able to:
- 55.01 Describe how routing loops can occur in distance vector routing.
  - 55.02 Describe several methods used by distance vector routing protocols to ensure that routing information is accurate.
  - 55.03 Configure RIP.
  - 55.04 Use the ip classless command.
  - 55.05 Troubleshoot RIP.
  - 55.06 Configure RIP for load balancing.
  - 55.07 Configure static routes for RIP.
  - 55.08 Verify RIP.
  - 55.09 Configure IGRP.
  - 55.10 Verify IGRP operation.
  - 55.11 Troubleshoot IGRP.
- 56.0 **PERFORM TASKS RELATED TO PROTOCOL TROUBLESHOOTING**-The student will be able to:
- 56.01 Describe ICMP.
  - 56.02 Describe the ICMP message format and error message types.
  - 56.03 Identify potential causes of specific ICMP error messages.
  - 56.04 Describe ICMP control messages.
  - 56.05 Identify a variety of ICMP control messages used in networks today.
  - 56.06 Determine the causes for ICMP control messages.
- 57.0 **EXAMINE AND TEST NETWORKS**--The student will be able to:
- 57.01 Use the commands to gather detailed information about the routes installed on the router.
  - 57.02 Configure a default route or default network.
  - 57.03 Understand how a router uses both Layer 2 and Layer addressing to move data through the network.
  - 57.04 Use commands to the router at different OSI layers.
- 58.0 **DEFINE, EXPLAIN AND DESCRIBE ACCESS LISTS**-The student will be able to:
- 58.01 Describe the differences between standard and extended ACLs.
  - 58.02 Explain the rules for placement of ACLs.
  - 58.03 Create and apply named ACLs.
  - 58.04 Describe the function of firewalls.
  - 58.05 Use ACLs to restrict virtual terminal access.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207030  
Course Title: Network 3, *Infrastructure*  
Course Credit: 1

**COURSE DESCRIPTION:**

This course continues the study of network support services. The content includes IT management skills, troubleshooting and diagnostic techniques; network design, devices, topographies, protocols and standards; e-mail and Internet activities, network traffic control and security, and WAN vs. LAN technologies. After successful completion of Networking 3, students will have met Occupational Completion Point - Data Code D, Network Administrator SOC Code - 15-1070

**MANAGEMENT**

08.0 INCORPORATE APPROPRIATE LEADERSHIP AND SUPERVISION TECHNIQUES, CUSTOMER SERVICE STRATEGIES, AND STANDARDS OF PERSONAL ETHICS TO ACCOMPLISH JOB OBJECTIVES AND ENHANCE WORKPLACE PERFORMANCE-The student will be able to:

08.18 Develop diplomatic methods to communicate with customers.

**WORK-BASED LEARNING**

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES-The student will be able to:

20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4

20.30 Discuss the use of technology in a network support services environment. LA.C.3.4.

**NETWORK SUPPORT**

37.0 PROVIDE NETWORK SUPPORT AND ASSISTANCE BY TROUBLESHOOTING AND DIAGNOSING THROUGH DIRECT CONTACT REMOTE ACCESS-The student will be able to:

37.01 Apply appropriate diagnostic techniques to solve network problems.

37.12 Perform local network support using various troubleshooting and diagnostic techniques.

37.03 Perform remote network support using various remote access methods.

60.0 DEVELOP ELECTRONIC COMMUNICATIONS SKILLS-The student will be able to:

60.03 Exhibit proficiency in using Internet services.

60.05 Exhibit proficiency in downloading and uploading Internet information.

60.06 Perform web-based research to solve specific network problems.

## Network Support Services

**61.0 PERFORM LOGICAL AND PHYSICAL NETWORK DESIGN ACTIVITIES**—The student will be able to:

- 61.01 Describe the various LAN communication problems.
- 61.02 Describe the effects of LAN segmentation with bridges, routers, and switches.
- 61.03 Describe the operation, characteristics and benefits of VLANs.
- 61.04 Explain and identify LAN design goals, issues, and methodology.
- 61.05 Demonstrate the ability to analyze equipment necessary to meet specific design requirement.
- 61.06 Demonstrate the ability to create physical and logical network implementation documentation.

**62.0 DEMONSTRATE PROFICIENCY IN SELECTING APPROPRIATE VARIOUS ROUTING PROTOCOLS AND IP ROUTING CONFIGURATION FOR VARIOUS NETWORK DESIGNS**—The student will be able to:

- 62.01 Describe the two parts of network addressing, and then identify the parts in specific protocol address examples.
- 62.02 Create the different classes of IP addresses [and sub netting].
- 62.03 Configure IP addresses.
- 62.04 Verify IP addresses.
- 62.05 Identify the functions of the TCP/IP transport-layer protocols.
- 62.06 Identify the functions of the TCP/IP network-layer protocols.
- 62.07 Identify the functions performed by ICMP.
- 62.08 Configure IPX access lists and SAP filters to control traffic.
- 62.09 Explain the services of separate and integrated multi-protocol routing.
- 62.10 List problems that each routing type encounters when dealing with topology changes and describe techniques to reduce the number of these problems.

**63.0 DEMONSTRATE PROFICIENCY IN USING NETWORK TRAFFIC FILTERING TO IMPROVE NETWORK PERFORMANCE AND PROVIDE BASIC LEVELS OF SECURITY**—The student will be able to:

- 63.01 Define and describe the purpose and operation of network traffic filtering.
- 63.02 Demonstrate proficiency in using configuration and interface commands to perform and monitor network traffic filtering.

**64.0 PERFORM NETWORK MANAGEMENT ACTIVITIES RELATED TO DOCUMENTATION, SECURITY, PERFORMANCE, ADMINISTRATION, TROUBLESHOOTING AND COPING WITH ENVIRONMENTAL FACTORS**—The student will be able to:

- 64.01 Perform documentation activities for networks, such as logs, journals, diagrams, labeling schemes, layouts, software listings, user policy, security policy.
- 64.02 Plan network security measures by establishing security policies and procedures, including user policies, authentication procedures, back-up and data recovery procedures, and redundancy techniques.
- 64.03 Demonstrate proficiency in using network monitoring software.
- 64.04 Explain the procedures necessary to monitor, create benchmarks, and plan for improvement of network performance.
- 64.05 Explain the administrative side of network management, including physical and logical boundaries, costs, error report documentation and the management of human resources.

## Network Support Services

### **65.0 IDENTIFY AND DESCRIBE VARIOUS WAN FUNCTIONS, DEVICES, AND DEMONSTRATE UNDERSTANDING OF THE WAN DESIGN PROCESS**—The student will be able to:

- 65.01 Describe the functions of private addressing and be able to explain the major features of and configure NAT, PAT, and DHCP.
- 65.02 Describe the major features of WAN technology, including, devices, standards, encapsulation, link options, and packet and circuit switching.
- 65.03 Perform WAN design activities that require using the necessary steps in WAN design, the three-layered design model, and various other design models.

### **66.0 DESCRIBE THE OPERATION AND IMPLEMENTATION OF VIRTUAL PRIVATE NETWORKS**—The student will be able to:

- 66.01 Describe the virtual private network operation.
- 66.02 Describe the virtual private network implementation.
- 66.03 Demonstrate an understanding of tunneling.
- 66.04 Describe the end-to-end virtual dialup process.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207050  
Course Title: Networking 4, *Infrastructure*  
Course Credit: 1

**COURSE DESCRIPTION:**

This course continues the study of network support services. The – student will learn to install, configure, and maintain large networks. Student will also be able to demonstrate proficiency in defining, configuring and trouble shooting the following protocols: IP, IGRP, IPX, Async Routing, AppleTalk, Extended Access Lists, IP RIP, Route Redistribution, RIP, Route Summarization, OSPF, VLSM, BGP, Serial, Frame Relay, ISDN, ISL, X.25, DDR, PSTN, PPP, VLANs, Ethernet, Access Lists, 802.10, FDDI, Transparent and Translational Bridging installation After successful completion of Networking 4 - Infrastructure, students will have met Occupational Completion Point - Data Code E, Senior Network Administrator SOC Code - 15-1071

**WORK-BASED LEARNING**

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES–The student will be able to:

- 20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4.
- 20.30 Discuss the use of technology in a network support services environment. LA.C.3.4.

**NETWORK/SOFTWARE SUPPORT**

71.0 COMPARE AND CONTRAST HIERARCHICAL NETWORK DESIGN MODELS AND SCALABLE INTERNETWORKS–the student will be able to:

- 70.01 Show proficiency in the use of the three-layer hierarchical design model.
- 70.02 Describe router functions in the core layer, distribution layer, and access layer.
- 70.03 Describe key characteristics of making the network reliable, available, responsive, efficient, adaptable, accessible, scalable and secure.
- 70.04 Compare and contrast Equal-Cost load balancing with RIP and Unequal-Cost load balancing with IGRP.

71.0 DISCUSS ADVANCED IP ADDRESSING MANAGEMENT–the student will be able to:

- 71.02 Describe and explain IPv4 addressing, Internet's address architecture, classes of IP addresses, and perform subnet masking.
- 71.02 Understand and explain Classless Interdomain Routing (CIDR), route aggregation, supernetting and address allocation.
- 71.03 Discuss and explain Variable-Length Subnet Masks along with classless and classful routing protocols.
- 71.04 Compare and contrast route summarization and route flapping.
- 71.05 Describe and discuss Network Address Translation (NAT), private addressing with NAT, private IP addresses (RFC 1918) and discontinuous subnets.
- 71.06 Use IP unnumbered and DHCP operations
- 71.07 Configure IOS DHCP server, Easy IP and IP helper addresses

## Network Support Services

- 71.08 Discuss IP addressing crisis and solutions with IPv6 address formats.
- 71.09 Configure IP unnumbered in a lab setting.

### **72.0 DEMONSTRATE PROFICIENCY IN BASIC ROUTER CONFIGURATION—the student will be able to:**

- 72.01 Build 'Start.TXT', capture hyperterminal and telnet sessions, create access control list and extended pings, and configure VLSM using routing fundamentals.
- 72.02 Configure static routing and dynamic routing using distance-vector routing protocols, link-state routing protocols, and hybrid routing.
- 72.03 Configure static default routes and default routing with IGRP using default route caveats and floating static routes
- 73.04 Describe and explain convergence issues and route calculation fundamentals.
- 72.05 Start routing process using various configurations, initiate routing updates and routing metrics.
- 72.06 Show proficiency in migrating from RIP to EIGRP.
- 72.07 Configuring default routing with RIP and IGRP, configuring floating static routes.

### **73.0 DEMONSTRATE PROFICIENCY IN THE USE OF OSPF—The student will be able to:**

- 73.01 Discuss issues addressed by the use OSPF, list and define OSPF terminology, list OSPF states and OSPF network types, describe OSPF Hello protocol and Steps of OSPF operation.
- 73.02 Establish router adjacencies, elect a DR and a BDR, and discover routes.
- 73.03 Select appropriate routes and maintain routing information, configuring OSPF on routers within a single area.
- 73.04 Use optional configuration commands and configure OSPF over NBMA in a lab setting.
- 73.05 Describe Full-Mesh Frame Relay, Partial-Mesh Frame Relay, Point-to-Multipoint OSPF.

### **74.0 UNDERSTAND AND DISCUSS MULTIAREA OSPF OPERATION AND CONFIGURATION—The student will be able to:**

- 74.01 Configure OSPF, examining the DR/BDR election process
- 74.02 Configure Point-to-Multipoint OSPF over frame relay, create multiple OSPF areas, use OSPF router types, and incorporate OSPF LSA and area types.
- 74.03 Configuring OSPF operation across multiple areas and flooding LSUs to multiple areas, updating the routing table
- 74.04 Configure Multiarea OSPF, using and configuring OSPF multiarea components, and configuring OSPF route summarization.
- 74.05 Verify OSPF operation, show commands, clear and debug commands.

### **75.0 DEMONSTRATE THE USE OF STUB AND TOTALLY STUBBY AREAS—The student will be able to:**

- 75.01 Use stub and totally stubby areas.
- 75.02 Set up stub and totally stub area criteria.
- 75.03 Configure stub and totally stubby areas.
- 75.04 Set up a OSPF stub area configuration example.

## Network Support Services

- 75.05 Set up a OSPF totally stubby configuration example.
- 75.06 Monitor multiarea OSPF, verifying multiarea OSPF operation
- 75.07 Create a multiarea OSPF.

### 76.0 CONFIGURE AND DEFINE VIRTUAL LINKS-The student will be able to:

- 76.01 Meet the backbone area requirements.
- 76.02 Configure virtual links.
- 76.03 Set up a virtual link configuration example.
- 76.04 Show not-so-stubby areas.
- 76.05 Demonstrate how NSSA operates.
- 76.06 Configure a stub area and a totally stubby area.
- 76.07 Configure an NSSA and configure virtual links.

### 77.0 DEMONSTRATE PROFICIENCY IN THE USE OF EIGRP-The student will be able to:

- 77.01 Define and explain EIGRP fundamentals, features, components, operations.
- 77.02 Configure and monitor EIGRP in lab exercise.

### 78.0 DEMONSTRATE PROFICIENCY IN ROUTE OPTIMIZATION-The student will be able to:

- 78.01 Show how to control routing updates, policy routing, and route redistribution.
- 78.02 Create a route optimization configuration in lab setting.

### 79.0 DEMONSTRATE PROFICIENCY IN THE USE OF BGP-The student will be able to:

- 79.01 Define and explain autonomous systems and basic BGP operations.
- 79.02 Configure and monitor BGP operations and routing process.
- 79.03 Define and explain BGP attributes and the BGP decision process.
- 79.04 Create BGP configuration in lab setting.
- 79.05 Develop a scaling BGP and route reflectors.
- 79.06 Set up BGP route filtering and policy routing.
- 79.07 Explain the community attribute and peer groups.
- 79.08 Explain redundancy, symmetry, and load balancing.
- 79.09 Define and explain BGP redistribution.
- 79.10 Perform scaling BGP lab exercises and configure BGP in a lab setting.

### 80.0 DEFINE AND SHOW PROFICIENCY IN SECURITY-The student will be able to:

- 80.01 Show proficiency in securing router access using access lists.
- 80.02 Show proficiency in using dynamic access lists using lock-and-key.
- 80.03 Show proficiency in session filtering.
- 80.04 Define and explain context-based access control.
- 80.05 Use an alternative to access lists.
- 80.06 Configure router security in a lab setting.

### 81.0 USING LAB EQUIPMENT, DEMONSTRATE THE SETUP, CONFIGURATION, CONNECTIVITY OF ROUTERS TO CREATE A SMALL WAN-The student will be able to:

## Network Support Services

- 81.01 Demonstrate the use of remote access.
- 81.02 Select appropriate WAN technologies for different scenarios.
- 81.03 Select remote access solutions for different technologies.
- 81.04 Assemble and Cable WAN components.

### **82.0 SHOW THE PROCESS OF USING MODEMS AND ASYNCHRONOUS DIALUP CONNECTIONS-**

The student will be able to:

- 82.01 List, describe and verify modem functions.
- 82.02 Configure asynchronous interfaces and terminal lines.
- 82.03 Demonstrate proficiency in the creation of modem configurations.
- 82.04 Configuring a Windows PC dialup connection.
- 82.05 Use dialup connection configurations.

### **83.0 CONFIGURE AND VERIFY PPP CONFIGURATIONS-**The student will be able to:

- 83.03 Demonstrate the use of PPP authentication, PPP callback, PPP compression, and PPP multilink.
- 83.04 Create and verifying PPP configurations.

### **84.0 CONFIGURE AND MONITOR ISDN AND DDR-**The student will be able to:

- 84.01 Explain and discuss ISDN architecture and ISDN protocol layers.
- 84.02 Configure ISDN BRI Dial-on-Demand, static routing and default routing, and ISDN PRI.
- 84.03 Create optional configurations.
- 84.04 Monitor the ISDN interface.
- 84.05 Create ISDN configurations.

### **85.0 CONFIGURE DIALER PROFILES-**The student will be able to:

- 85.04 Demonstrate the use of Legacy DDR.
- 85.05 Create and use various dialer profiles.
- 85.06 Verify and monitor dialer profiles configurations.

### **86.0 CREATE AND TROUBLE-SHOOT X.25 CONFIGURATIONS-**The student will be able to:

- 86.01 Show proficiency in the use of X.25 concepts.
- 86.02 Configure and Trouble-shoot X.25.

### **87.0 CONFIGURE AND TROUBLE-SHOOT FRAME RELAY-**The student will be able to:

- 87.01 Show proficiency using frame relay concepts.
- 87.02 Configure frame relay.
- 87.03 Create various frame relay topologies and configurations.
- 87.04 Demonstrate proficiency managing frame relay traffic.
- 87.05 Show the process of frame relay traffic shaping.
- 87.06 Create on demand routing using frame relay.
- 87.07 Trouble-shoot frame relay traffic configurations.

### **88.0 DEMONSTRATE THE USE OF WAN BACKUP AND DIAL BACKUP-**The student will be able to:

- 88.01 Demonstrate dial backup.
- 88.02 Demonstrate backup interface operations.

## Network Support Services

- 88.03 Demonstrate routing with the load backup feature.
- 88.04 Verifying dial backup configurations in a lab setting.
- 88.05 Create various WAN backup configurations in a lab setting.

**89.0 DEMONSTRATE THE USE OF QUEUING AND COMPRESSION TECHNIQUES**-The student will be able to:

- 89.03 Demonstrate proficiency using various queuing options.
- 89.04 Demonstrate proficiency optimizing traffic flow with data compression.

**90.0 DEMONSTRATE THE USE OF SCALING IP ADDRESSES WITH NAT**-The student will be able to:

- 90.03 Define and explain NAT concepts and terminology.
- 90.04 Demonstrate proficiency in configuring, creating and verifying NAT configurations in lab setting.

**91.0 DEMONSTRATE PROFICIENCY USING AAA TO SCALE ACCESS CONTROL**-The student will be able to:

- 91.01 List and define AAA concepts and terminology.
- 91.02 Demonstrate proficiency configuring AAA.
- 91.03 Perform lab exercises using access control configurations.

**92.0 DISCUSS AND EXPLAIN EMERGING REMOTE-ACCESS TECHNOLOGIES**-The student will be able to:

- 92.02 List and define features and capabilities of cable, modems, wireless, network access, multichannel multipoint distribution services, local multipoint distribution services, wireless local area networking, very-high-data-rate digital subscriber line (VDSL).

**93.0 DEMONSTRATE PROFICIENCY CONFIGURING A 700 SERIES ROUTER**-The student will be able to:

- 93.01 Use a series router.
- 93.02 Configure the 700 Series router in a lab setting.
- 93.03 Use various IOS configurations in a lab setting.

**94.0 UNDERSTAND AND DESCRIBE KEY CHARACTERISTICS OF VARIOUS SWITCHING TECHNOLOGIES, LAN SWITCHING AND THE HIERARCHICAL MODEL OF NETWORK DESIGN, AND THE BUILDING-BLOCK APPROACH**-The student will be able to:

- 94.01 Discuss the requirements of the evolving campus structure and the issues with traditional network designs.
- 94.02 Describe the fundamental campus elements and contributing variables to campus networks.
- 94.03 Compare and contrast the traditional 80/20 rule of network traffic and the new 20/80 rule of network traffic.
- 94.04 Discuss switching and the OSI model, layer 2, 3, and 4 switching, and multiplayer switching.
- 94.05 Discuss the core layer, the distribution layer, and the access layer in relation to switching.
- 04.06 List and describe the advantages and disadvantages of the building-block approach, scaling the switch block, building the core block and layer 2 and 3 backbone scaling.

## Network Support Services

### 95.0 UNDERSTAND AND DESCRIBE CAMPUS NETWORKS, DESIGN MODELS, AND SWITCHING TECHNOLOGIES-The student will be able to:

- 95.01 List and explain key characteristics of various switching technologies.
- 95.02 Discuss LAN switching and the hierarchical model of network design.
- 95.03 Show proficiency using the building-block approach to networking.

### 96.0 LIST AND DESCRIBE VARIOUS TYPES OF LAN MEDIA-The student will be able to:

- 96.01 Show proficiency using modem functions and maintaining modem auto-configurations.
- 96.02 Create configurations for asynchronous connections.
- 96.03 Create various modem configurations.

### 97.0 SHOW PROFICIENCY CONFIGURING A SWITCH-The student will be able to:

- 97.01 Demonstrate the process for initial connectivity to a switch.
- 97.02 Show proficiency creating the basic configuration of a switch.
- 97.03 List and explain important IOS features.

### 98.0 DEMONSTRATE PROFICIENCY CONFIGURING VLANS-The student will be able to:

- 98.02 Understand and explain VLANs.
- 98.02 Discuss VLAN basics and VLAN types.
- 98.03 Configure a VLAN in a lab setting.
- 98.04 Show use of VLAN identification techniques and VLAN trunking protocol.
- 98.06 Create VTP configuration and use VTP pruning.

### 99.0 UNDERSTAND AND EXPLAIN SPANNING TREE PROTOCOL (STP) AND REDUNDANT LINKS-The student will be able to:

- 99.01 Discuss Basic STP Operations and STP Processes.
- 99.02 Compare and contrast VLANs and STP.
- 99.03 Show how STP is used in the Campus Network.
- 99.04 Demonstrate the resolution of Redundant Links

### 100.0 DEMONSTRATE PROFICIENCY ROUTING BETWEEN VLANS-The student will be able to:

- 100.01 Understand and discuss VLAN issues.
- 100.02 Route switch modules.
- 100.03 Show proficiency using external routers in a lab setting.

### 101.0 DEMONSTRATE PROFICIENCY WITH MULTILAYER SWITCHING-The student will be able to:

- 101.01 Define and explain MLS Processes.
- 101.02 Create basic MLS configurations.
- 101.03 Show proficiency using flow masks.
- 101.04 Show how to use MLS on the switch.

## Network Support Services

- 102.0 DEMONSTRATE THE USE OF HOT STANDBY ROUTING PROTOCOL (HSRP)**-The student will be able to:
- 102.01 Define and explain HSRP operations.
  - 102.02 Create HSRP configurations in a lab setting.
- 103.0 UNDERSTAND AND USE IGMP AND MULTICASTING** - the student will be able to:
- 103.01 Define and explain multicasting.
  - 103.02 Understand and discuss IGMP.
  - 103.03 Show proficiency routing multicast traffic.
  - 103.04 Demonstrate proficiency using multicast routing protocols.
  - 103.05 Configure IP multicast routing in a lab setting.
  - 103.06 List and describe optional IP multicast routing tasks.
- 104.0 DEMONSTRATE PROFICIENCY RESTRICTING NETWORK ACCESS**-The student will be able to:
- 104.01 Show proficiency creating networking policies.
  - 104.02 Discuss and explain basic network security techniques.
  - 104.03 Demonstrate execution of policy configurations on a set of routers.
- 105.0 DEMONSTRATE PROFICIENCY USING NETWORK TROUBLESHOOTING TOOLS AND BASIC NETWORK MANAGEMENT DIAGNOSTIC TOOLS**-The student will be able to:
- 105.01 Explain and discuss troubleshooting methodologies and general problem-solving concepts.
  - 105.02 List and define general considerations in troubleshooting.
  - 105.03 Define and explain each component of the general problem-solving model.
  - 105.04 Demonstrate proficiency using common management and diagnostic tools.
  - 105.05 Show proficiency using network management software.
  - 105.06 Demonstrate proficiency using router diagnostic commands.
  - 105.07 Familiarize logging and error message formats.
  - 105.08 Demonstrate proficiency interacting with technical **support**.
- 106.0 LIST AND DEFINE THE COMMONLY USED PROTOCOLS, ROUTING TECHNIQUES, AND SWITCHING PROCESSES** -The student will be able to:
- 106.06 List and define network services, layer 2 LAN protocols, and layer 2 WAN protocols.
  - 106.07 race packets through a router.
  - 106.08 Define and explain packet switching paths.
  - 106.09 Identify performance issues affecting packet switching.
  - 106.10 Define and explain low-level troubleshooting.
- 107.0 DEMONSTRATE PROFICIENCY TROUBLESHOOTING TCP/IP, LAN SWITCH ENVIRONMENT, VLANs, FRAME RELAY, AND ISDN**-The student will be able to:
- 107.03 List, define, and explain theory, concepts, and terminology of TCP/IP, LAN switch environment, spanning tree, VLANs, frame relay, and ISDN.
  - 107.04 List, define, and explain common problems with TCP/IP, LAN switching, and ISDN.

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- 107.03 List, define, and explain common scenarios with VLANs, frame relay, and ISDN.
- 107.08 Troubleshoot TCP/IP in a Windows environment; use LAN switch troubleshooting tools, explain general VLAN troubleshooting issues; list and explain the steps in frame relay troubleshooting and ISDN problem isolation.
- 107.09 Use show commands to verify LAN switch configuration settings.
- 107.10 Use show and debug commands for TCP/IP, router VLANs, frame relay, and ISDN.
- 107.11 Use TCP/IP diagnostic tools.

### **108.0 DEMONSTRATE PROFICIENCY CONFIGURING AND TROUBLE SHOOTING IPX AND APPLE TALK** -The student will be able to:

- 108.01 List, define, and explain theory, concepts, and terminology of IPX and AppleTalk.
- 108.02 Demonstrate proficiency configuring IPX and AppleTalk.
- 108.03 Demonstrate proficiency trouble shooting IPX and Apple Talk.
- 108.05 Demonstrate proficiency using show and debug command with IPX and AppleTalk.

### **109.0 Demonstrate proficiency troubleshooting EIGRP, OSPF, and BGP**-The student will be able to:

- 109.02 List, define, and explain theory, concepts, and terminology of EIGRP, OSPF, and BGP.
- 109.02 Demonstrate proficiency configuring AAA, EIGRP, OSPF, and BGP.
- 109.03 Demonstrate proficiency trouble shooting EIGRP, OSPF, and BGP.
- 109.04 Demonstrate proficiency using the show and debug commands for OSPF and BGP.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207060  
Course Title: Networking 5  
Course Credit: 1

**COURSE DESCRIPTION:**

This course continues the study of network support services. The content includes **wireless networking technologies, implementation, management and security**. After successful completion of Networking 5, students will have met Occupational Completion Point - Data Code F, **Wireless Network Specialist**. SOC Code - 15-1080

**WORK-BASED LEARNING**

20.0 **PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES** -The student will be able to:

- 20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4
- 20.30 Discuss the use of technology in a network support services environment. LA.C.3.4
- 20.32 Discuss the management/supervisory skills needed in a network support service environment.

121.0 **DEMONSTRATE PROFICIENCY IN APPLYING RADIO FREQUENCY (RF) TECHNOLOGIES**-The student will be able to:

- 120.01 Define and apply the basic concepts of RF behavior.
- 120.02 Understand the applications of basic RF antenna concepts.
- 120.03 Understand and apply the basic components of RF
- 120.04 Identify some of the different uses for spread spectrum technologies.
- 120.05 Comprehend the differences between, and apply the different types of spread spectrum technologies.
- 120.06 Identify and apply the concepts which make up the functionality of spread spectrum technology.
- 120.07 Identify the laws set forth by the FCC that govern spread spectrum technology, including power outputs, frequencies, bandwidths, hop times, and dwell times.

121.0 **DEVELOP AN AWARENESS OF WIRELESS LAN TECHNOLOGIES**-The student will be able to:

- 121.01 Identify and apply the processes involved in authentication and association.
- 121.02 Recognize the concepts associated with wireless LAN service sets.
- 121.03 Understand the implications of the following power management features of wireless LANs.
- 121.04 Specify the modes of operation involved in the movement of data traffic across wireless LANs.

## Network Support Services

**122.0 PERFORM IMPLEMENTATION AND MANAGEMENT ACTIVITIES**—The student will be able to:

- 122.01 Identify the technology roles for which wireless LAN technology is an appropriate technology application.
- 122.02 Identify the purpose of infrastructure devices and explain how to install, configure, and manage them.
- 122.03 Identify the purpose of wireless LAN client devices and explain how to install, configure, and manage them.
- 122.04 Identify the purpose of wireless LAN gateway devices and explain how to install, configure, and manage them.
- 122.05 Identify the basic attributes, purpose, and function of types of antennas.
- 122.06 Describe the proper locations and methods for installing antennas.
- 122.07 Explain the concepts of polarization, gain, beamwidth, and free-space path loss as they apply to implementing solutions that require antennas.
- 122.08 Identify the use of wireless LAN accessories and explain how to install, configure, and manage them.
- 122.09 Identify, understand, correct or compensate for wireless LAN implementation challenges.
- 122.10 Explain how antenna diversity compensates for multipath.
- 122.11 Identify and understand the importance and process of conducting a thorough site survey.
- 122.12 Identify and understand the importance of the necessary tasks involved in preparing to do an RF site survey.
- 122.13 Identify the necessary equipment involved in performing a site survey.
- 122.14 Understand the necessary procedures involved in performing a site survey.
- 122.15 Identify and understand site survey reporting procedures.

**123.0 DEVELOP AN AWARENESS OF WIRELESS SECURITY SYSTEMS**—The student will be able to:

- 123.01 Identify the strengths, weaknesses and appropriate uses of wireless LAN security techniques.
- 123.02 Describe types of wireless LAN security attacks, and explain how to identify and prevent them.
- 123.03 Given a wireless LAN scenario, identify the appropriate security solution from the following available wireless LAN security solutions.
- 123.04 Explain the uses of corporate security policies and how they are used to secure a wireless LAN.
- 123.05 Identify how and security precautions are used to secure a wireless LAN.

**124.0 DEMONSTRATE KNOWLEDGE OF WIRELESS INDUSTRY STANDARDS**—The student will be able to:

- 124.01 Identify, apply and comprehend the differences between wireless LAN standards.
- 124.02 Understand the roles of organizations in providing direction and accountability within the wireless LAN industry.
- 124.03 Identify the differences between the ISM and UNII bands.
- 124.04 Identify and understand the differences between the power output rules for point-to-point and point-to-multipoint links.
- 124.05 Identify the basic characteristics of infrared wireless LANs.

Florida Department of Education  
STUDENT PERFORMANCE STANDARDS

Secondary Course Number: 8207070  
Course Title: Networking 6  
Course Credit: 1

**COURSE DESCRIPTION:**

This course continues the study of network support services. The content includes network security. After successful completion of this course, students will have met Occupational Completion Point - Data Code G, Data Communications Analyst SOC Code 15-1081

20.0 PARTICIPATE IN WORK-BASED LEARNING EXPERIENCES - The student will be able to:

- 20.29 Participate in work-based learning experiences in a network support services environment. LA.C.3.4
- 20.30 Discuss the use of technology in a network support services environment. LA.C.3.4
- 20.32 Discuss the management/supervisors skills needed in a network support services environment.

130.0 DEMONSTRATE A KNOWLEDGE OF GENERAL SECURITY CONCEPTS—The student will be able to:

- 130.01 Describe access control.
- 130.02 Describe network authentication.
- 130.03 Understand the various types of network attacks (backdoors, DOS, spoofing, etc.)
- 130.04 Identify and modify non-essential services and protocols.
- 130.05 Identify malicious code (virus, worm, Trojan).
- 130.06 Configure system auditing, logging, and scanning as it relates to security procedures.

131.0 DEVELOP AN AWARENESS OF COMMUNICATION SECURITY CONCEPTS—The student will be able to:

- 131.05 Describe remote access protocols (VPN, RADIUS, L2TP, etc.).
- 131.06 Identify E-mail security concerns (hoaxes, spam, etc.).
- 131.07 Identify web (HTML) security concepts and designs (HTTP/S, IM, etc.).
- 131.08 Demonstrate an awareness of file transfer security concerns.
- 131.09 Describe and identify wireless networking security concerns and vulnerabilities.

132.0 DEVELOP AN AWARENESS OF NETWORK INFRASTRUCTURE SECURITY—The student will be able to:

- 132.16 Install and configure network firewalls.
- 132.17 Identify security concerns with various wiring media (copper, fiber).
- 132.18 Identify security concerns associated with removable media and storage devices.

## Network Support Services

- 132.19 Demonstrate an awareness of security topologies (security zones, Intranets, NAT, etc.).
- 132.20 Configure and use intrusion detection software.
- 132.21 Establish security baselines (updates, patches, hotfixes, Access Control lists, etc.).
- 132.22 Demonstrate the ability to configure a Virtual Private Network (VPN).
- 132.23 Describe the function of Network Address Translation (NAT).

### **133.0 DEVELOP AN AWARENESS OF CRYPTOGRAPHY AND ITS RELATION TO SECURITY**—The student will be able to:

- 133.06 Demonstrate an understanding of security algorithms and encryption.
- 133.07 Use and apply Public Key Certificates.
- 133.08 Demonstrate an understanding of standards and protocols in commerce.

### **134.0 INCORPORATE ORGANIZATIONAL AND OPERATIONAL SECURITY IN AN APPROPRIATE AND EFFECTIVE MANNER**—The student will be able to:

- 134.06 Describe how to establish a network security policy.
- 134.07 Explain the importance of physical security to protect network resources.
- 134.08 Identify and use disaster recovery procedures.
- 134.09 Describe the importance of business continuity and its relationship to network and corporate security.
- 134.10 Describe security policies and procedures that would be used in a business environment.
- 134.11 Explain the importance of privilege management (access, password management, sign-on, etc.).
- 134.12 Describe the concept of forensics as it applies to network security (obtaining evidence of security breaches).
- 134.13 Explain the importance of educating users and supervisors in regard to network security.
- 134.14 Create documentation that describes standards and guidelines for a network security system.