Florida Department of Education
Curriculum Framework

Program Title: **Cloud Computing & Virtualization**
Program Type: **Career Preparatory**
Career Cluster: **Information Technology**

Career Certificate Program		
Program Number	Y100400	
CIP Number	0511090200	
Grade Level	30, 31	
Program Length	900 hours	
Teacher Certification	Refer to the **Program Structure** section.	
CTSO	PBL, BPA	
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.	
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml	
Basic Skills Level	Computation (Mathematics): 9	Communication (Reading and Language Arts): 9

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers such as a Computer Support Assistant, Network Support Technician, Cloud Specialist, Cloud Virtualization Engineer in the Information Technology career cluster; provides technical skill proficiency, and includes competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-specific skills, and knowledge of all aspects of the Information Technology career cluster.

The content includes but is not limited to 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.

Additional Information relevant to this Career and Technical Education (CTE) program is provided at the end of this document.

Program Structure

This program is a planned sequence of instruction consisting of five occupational completion points.

This program is comprised of courses which have been assigned course numbers in the SCNS (Statewide Course Numbering System) in accordance with Section 1007.24 (1), F.S. Career and Technical credit shall be awarded to the student on a transcript in accordance with Section 1001.44 (3)(b), F.S.

To teach the courses listed below, instructors must hold at least one of the teacher certifications indicated for that course.

The following table illustrates the postsecondary program structure:

OCP	Course Number	Course Title	Teacher Certification	Length
A	OTA0040	Information Technology Assistant	OTA0040 Teacher Certifications	150 hours
B	EEV0504	Computer Support Assistant	BUS ED 1 @2 COMPU SCI 6 COMP SVC 7G CYBER TECH 7G INFO TECH 7G	150 hours
C	CTS0026	Network Support Technician		150 hours
D	CTS0054	Cloud Analyst		150 hours
E	CTS0056	Cloud Virtualization Specialist		300 hours

Note: OTA0040 is a core.

Common Career Technical Core – Career Ready Practices

Career Ready Practices describe the career-ready skills that educators should seek to develop in their students. These practices are not exclusive to a Career Pathway, program of study, discipline or level of education. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

1. Act as a responsible and contributing citizen and employee.

2. Apply appropriate academic and technical skills.

3. Attend to personal health and financial well-being.

4. Communicate clearly, effectively and with reason.

5. Consider the environmental, social and economic impacts of decisions.

6. Demonstrate creativity and innovation.

7. Employ valid and reliable research strategies.

8. Utilize critical thinking to make sense of problems and persevere in solving them.

9. Model integrity, ethical leadership and effective management.

10. Plan education and career path aligned to personal goals.

11. Use technology to enhance productivity.

12. Work productively in teams while using cultural/global competence.

Standards

Information Technology Assistant (OTA0040) is the first course in this and other programs within the Information Technology Career Cluster. Standards 01.0 – 15.0 are associated with this course.

After successfully completing this program, the student will be able to perform the following:

01.0 Demonstrate knowledge, skill, and application of information technology to accomplish job objectives and enhance workplace performance.
02.0 Develop an awareness of microcomputers.
03.0 Demonstrate an understanding of networks.
04.0 Use word processing applications to enhance the effectiveness of various types of documents and communication.
05.0 Use presentation applications to enhance communication skills.
06.0 Use spreadsheet applications to enhance communication skills.
07.0 Use database applications to store and organize data.
08.0 Use electronic mail to enhance communication skills.
09.0 Investigate individual assessment and job/career exploration and individual career planning that reflect the transition from school to work, lifelong learning, and personal and professional goals.
10.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
11.0 Demonstrate competence using computer networks, internet and online databases to facilitate collaborative or individual learning and communication.
12.0 Develop awareness of computer languages, web-based and software applications, and emerging technologies.
13.0 Demonstrate an understanding of basic html by creating a simple web page.
14.0 Demonstrate comprehension and communication skills.
15.0 Use social media to enhance online communication and develop an awareness of a digital footprint.
16.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
17.0 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.
18.0 Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment.
19.0 Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace.
20.0 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.
21.0 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.
22.0 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.

23.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, internet, remote access, or direct contact.
24.0 Demonstrate proficiency using graphical user interface (GUI) operating systems.
24.0 Demonstrate language arts knowledge and skills. The student will be able to
25.0 Demonstrate mathematics knowledge and skills. The student will be able to
26.0 Incorporate appropriate leadership and supervision techniques, customer service strategies, and standards of personal ethics to accomplish job objectives and enhance workplace performance.
27.0 Participate in work-based learning experiences.
28.0 Perform end user support and assistance by troubleshooting and diagnosing through telephone, e-mail, remote access, or direct contact.
29.0 Perform installation and configuration activities.
30.0 Demonstrate proficiency using computer networks.
31.0 Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers.
32.0 Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability.
33.0 Demonstrate proficiency in managing, configuring and troubleshooting storage use.
34.0 Demonstrate proficiency in configuring and troubleshooting network connections.
35.0 Demonstrate proficiency in implementing, monitoring, and troubleshooting security.
36.0 Evaluate an analyze cloud principles used in cloud computing.
37.0 Identify the components of cloud-based services.
38.0 Evaluate cloud-based services.
39.0 Use cloud-based services.
40.0 Evaluate and analyze techniques and methods of cloud deployment.
41.0 Evaluate the risks of cloud-based systems.
42.0 Demonstrate an awareness of cloud implementation.
43.0 Demonstrate an understanding of virtualization concepts.
44.0 Install and configure the virtualization server platform.
45.0 Install, configure and manage virtualized clients.
46.0 Demonstrate proficiency in managing a virtualization infrastructure.
47.0 Demonstrate an understanding of storage technologies and storage configuration.
48.0 Demonstrate proficiency in network optimization using network protocols, ports, and topologies.
49.0 Understand security in a virtualized environment.
16.0

Florida Department of Education
Student Performance Standards

Program Title: Cloud Computing & Virtualization
Career Certificate Program Number: Y100400

Course Number: OTA0040 **Occupational Completion Point: A** **Information Technology Assistant – 150 Hours**	
Information Technology Assistant (OTA0040) is part of several programs across the various CTE career clusters. To ensure consistency, the standards and benchmarks for this course (01.0 – 15.0) have been placed in a separate document. To access this document, visit: Information Technology Assistant (OTA0040)	
Course Number: EEV0504 **Occupational Completion Point – B** **Computer Support Assistant – 150 Hours**	
25.0	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:
	25.01 Develop strategies for resolving customer conflicts.
26.0	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:
	26.01 Identify and describe the functions of main processing boards (e.g., CPUs, RAM, ROM, bus architecture).
	26.02 Identify and describe the functions of communication ports (e.g., serial and parallel ports).
	26.03 Identify and describe the functions of peripheral devices (e.g., scanners, modems, hard drives, printers).
	26.04 Identify and describe the components of portable systems (e.g., battery, LCD, AC adapter, PDAs).
	26.05 Troubleshoot, install and upgrade computers and peripherals.
	26.06 Perform system hardware setup
	26.07 Demonstrate an understanding of input/output devices.
	26.08 Install and configure of applications software, hardware, and device drivers.
	26.09 Demonstrate an understanding of the operation and purpose of hardware components.
	26.10 Install operating system software.
	26.11 Customize operating systems.
	26.12 Install application software.

	26.13 Perform storage formatting and preparation activities.
	26.14 Identify data measurement (e.g., bits, bytes, kilobytes).
	26.15 Install and configure RAID.
	26.16 Recognize and report on server room environmental issues (temperature, humidity/ESD/power surges, back-up).
27.0	Diagnose and troubleshoot common module problems and system malfunctions of computer software, hardware, peripherals, and other office equipment. The student will be able to:
	27.01 Troubleshoot a personal computer system.
	27.02 Identify configuration problems.
	27.03 Identify software problems.
	27.04 Identify hardware malfunctions.
	27.05 Identify network malfunctions.
	27.06 Resolve computer error messages.
	27.07 Understand and troubleshoot memory and cache systems.
	27.08 Verify that drives are the appropriate type.
	27.09 Describe knowledge database search procedures used to identify possible solutions when troubleshooting software and hardware problems.
28.0	Identify issues, procedures and devices for protection within the computing environment, including people, hardware and the surrounding workspace. The student will be able to:
	28.01 Apply basic rules for hardware safety.
	28.02 Demonstrate proficiency in basic preventative hardware maintenance.
	28.03 Apply special disposal procedures that comply with environmental guidelines for batteries, CRTs, toner kits/cartridges, chemical solvents and cans, and MSDS.
	28.04 Apply ergonomic principles applicable to the configuration of computer workstations.
	28.05 Describe ethical issues and problems associated with computers and information systems.
29.0	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:
	29.01 Identify EDO RAM, DRAM, SRAM, RIMM, VRAM, SDRAM, and WRAM.
	29.02 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.
	29.03 Identify printer parallel port, COM/serial port, floppy drive, hard drive, Memory, and Boot sequence.
30.0	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:

	30.01 Identify types of printers—Laser, Inkjet, Dot Matrix.
	30.02 Identify care and service techniques and common problems with primary printer types.
	30.03 Implement and manage printing on a network.
31.0	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:
	31.01 Define networking and describe the purpose of a network.
	31.02 Identify the purposes and interrelationships among the major components of networks (e.g., servers, clients, transmission media, network operating system, network boards).
	31.03 Describe the various types of network topologies.
	31.04 Identify and describe the purpose of standards, protocols, and the Open Systems Interconnection (OSI) reference model.
	31.05 Configure network and verify network connectivity.
	31.06 Discuss the responsibilities of the network administrator (e.g., rights and responsibilities).
	31.07 Develop user logon procedures.
	31.08 Utilize network management infrastructures (e.g., network monitoring, alerting, security) to perform administrative tasks.
	31.09 Identify common backup strategies and procedures.
	31.10 Select and use appropriate electronic communications software and hardware for specific tasks.
	31.11 Compare and contrast Internet software and protocols.
	31.12 Diagnose and resolve electronic communications operational problems.
	31.13 Design and implement directory tree structures.
	31.14 Install services tools (SNMP, backup software).
	31.15 Perform full backup and verify backup.
	31.16 Identify bottlenecks (e.g., processor, bus transfer, I/O, disk I/O, network I/O, memory).
	31.17 Use the concepts of fault tolerance/fault recovery to create a disaster recovery plan.
	31.18 Document and test disaster recovery plan regularly, and update as needed.
32.0	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:
	32.01 Apply call center vocabulary.
	32.02 Listen and input information simultaneously.
	32.03 Apply first response assistance for minor repair work.

33.0	Demonstrate proficiency using graphical user interface (GUI) operating systems. The student will be able to:
	33.01 Identify parts of GUI windows.
	33.02 Create and use icons.
	33.03 Demonstrate proficiency in using menu systems.
	33.04 Demonstrate proficiency in using pointing and selection devices.
	33.05 Identify keyboard shortcuts and special function keys.
	33.06 Demonstrate proficiency in manipulating windows.
	33.07 Utilize help systems and hypertext links.
	33.08 Create, organize, and maintain file system directories.
	33.09 Organize desktop objects.
	33.10 Run multiple applications.
26.0	Demonstrate language arts knowledge and skills. The student will be able to
	26.01 Locate, comprehend and evaluate key elements of oral and written information.
	26.02 Draft, revise, and edit written documents using correct grammar, punctuation and vocabulary.
	26.03 Present information formally and informally for specific purposes and audiences.
27.0	Demonstrate mathematics knowledge and skills. The student will be able to
	27.01 Demonstrate knowledge of arithmetic operations.
	27.02 Analyze and apply data and measurements to solve problems and interpret documents.
	27.03 Construct charts/tables/graphs using functions and data.
Course Number: CTS0026 Occupational Completion Point – C Network Support Technician – 150 Hours	
50.0	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:
	50.01 Develop diplomatic methods to communicate with customers.
51.0	Participate in work-based learning experiences. The student will be able to:
	51.01 Participate in work-based learning experiences in a network support services environment.
	51.02 Discuss the use of technology in a network environment.
52.0	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:
	52.01 Apply first response assistance for minor repair work.
53.0	Perform installation and configuration activities. The student will be able to:
	53.01 Configure the operating system environment.
	53.02 Connect client workstation running similar operating system to the network.
	53.03 Configure Internet access for a network.
	53.04 Configure a web server.
	53.05 Use remote server to deploy operating system.
	53.06 Troubleshoot failed installations.
	53.07 Install and configure network services for interoperability.
	53.08 Monitor, configure, troubleshoot and control access to printers.
	53.09 Monitor, configure, troubleshoot and control access to files, folders, and shared folders.
	53.10 Monitor, configure, troubleshoot and control access to websites.
54.0	Demonstrate proficiency using computer networks. The student will be able to:
	54.01 Identify and describe the purpose of standards; protocols; and the Open Systems Interconnection (ISO) reference model.
55.0	Demonstrate proficiency in configuring and troubleshooting hardware devices and drivers. The student will be able to:
	55.01 Configure hardware devices.
	55.02 Configure driver signing options.
	55.03 Update device drivers.
	55.04 Troubleshoot problems with hardware.
56.0	Demonstrate proficiency in managing, monitoring, and optimizing system performance, reliability and availability. The student will be able to:
	56.01 Monitor and optimize usage of system resources.
	56.02 Manage processes.
	56.03 Optimize disk performance.
	56.04 Manage and optimize availability of system data and user data.
	56.05 Recover systems and user data.
57.0	Demonstrate proficiency in managing, configuring and troubleshooting storage use. The student will be able to:
	57.01 Configure and manage user profiles.

	57.02 Monitor, configure and troubleshoot disks and volumes.
	57.03 Configure data compression.
	57.04 Monitor and configure disk quotas.
	57.05 Recover from disk failures.
58.0	Demonstrate proficiency in configuring and troubleshooting network connections. The student will be able to:
	58.01 Install, configure and troubleshoot shared access.
	58.02 Install, configure and troubleshoot a virtual private network.
	58.03 Install, configure and troubleshoot network protocols.
	58.04 Install and configure network services.
	58.05 Configure, monitor and troubleshoot remote access.
	58.06 Install, configure, monitor and troubleshoot Terminal Services.
	58.07 Configure the properties of a connection.
	58.08 Install, configure and troubleshoot network adapters and drivers.
59.0	Demonstrate proficiency in implementing, monitoring, and troubleshooting security. The student will be able to:
	59.01 Encrypt data on a hard disk by using Encrypting File System.
	59.02 Implement, configure, manage and troubleshoot policies in an operating system environment.
	59.03 Implement, configure, manage and troubleshoot auditing.
	59.04 Implement, configure, manage and troubleshoot local accounts.
	59.05 Implement, configure, manage and troubleshoot account policy.
	59.06 Implement, configure, manage and troubleshoot security by using the Security Configuration Tool Set.
Course Number: CTS0054 Occupational Completion Point – D Cloud Analyst – 150 Hours	
60.0	Evaluate an analyze cloud principles used in cloud computing. The student will be able to:
	60.01 Describe the evolution of cloud computing.
	60.02 Compare and contrast drivers and limitations of cloud computing.
	60.03 Compare and contrast the four main deployment models for cloud computing, public, private, community, and hybrid.
	60.04 Describe the three main service models for cloud computing (SaaS, PaaS, and IaaS).

	60.05 Describe the role of the Internet and virtualization in cloud computing.
	60.06 Identify managed services in cloud computing.
61.0	Identify the components of cloud-based services. The student will be able to:
	61.01 Demonstrate proficiency in accessing web applications through web browser.
	61.02 Describe, identify and use thin clients to complete business tasks.
	61.03 Describe, identify and use thick clients to complete business tasks.
	61.04 Describe, identify and use mobile clients to complete business tasks.
	61.05 Explain application hosting.
	61.06 Describe multipurpose architecture.
62.0	Evaluate cloud-based services. The student will be able to:
	62.01 Perform calculations to identify the costs and savings of different cloud-based models for an organization.
	62.02 Compare and contrast cloud-based services used in industry.
	62.03 Identify the impacts to current and future staffing and operational needs.
	62.04 Evaluate performance of cloud-based solutions using performance indicators.
63.0	Use cloud-based services. The student will be able to:
	63.01 Compare and contrast outsourcing and cloud computing as alternatives for business.
	63.02 Identify and use cloud-based services to improve productivity.
	63.03 Describe the differences between capital expenditures (CapEx) and operational expenditures (OpEx).
	63.04 Compare and contrast cloud-based services for consumer and business.
	63.05 Use cloud-based services to perform collaboration online.
	63.06 Compare and contrast the user experience in a cloud-based service and a traditional business model.
64.0	Evaluate and analyze techniques and methods of cloud deployment. The student will be able to:
	64.01 Describe networking for cloud-based solutions.
	64.02 Describe the role of automation and self-service in regard to cloud-based solutions.
	64.03 Examine deployment and management of internal and external cloud services to complete business task.
	64.04 Articulate the role of standardization in cloud-based solutions.
	64.05 Express the impact of cloud systems on time to market.
	64.06 Examine the distribution over the Internet in cloud deployment.

65.0	Evaluate the risks of cloud-based systems. The student will be able to:
65.01	Identify and evaluate compliance risks relating to software and vendors in cloud-based systems.
65.02	Describe user privacy rights and privacy risks in cloud-based systems.
65.03	Describe legal risks in cloud-based systems.
65.04	Explain the role of vendors and dependencies in cloud-based solutions.
65.05	Explain the risks of hardware independence.
65.06	Identify the main aspects of identity management.
66.0	Demonstrate an awareness of cloud implementation. The student will be able to:
66.01	Describe the use of a Virtual Private network access to Local Area Network.
66.02	Describe the risk of connecting a local cloud network to the public Internet.
66.03	Identify and describe the components of cloud environment.
66.04	Describe networking topologies in cloud environment.
66.05	Describe serves, switches, and routers in cloud-based architecture.
66.06	Explain the role of the datacenter in cloud-based architecture.
Course Number: CTS0056 Occupational Completion Point – E Cloud Virtualization Specialist – 300 Hours	
67.0	Demonstrate an understanding of virtualization concepts. The student will be able to:
67.01	Describe the role of the virtual CPU in virtualization.
67.02	Describe the role of virtual memory in virtual component.
67.03	Identify the process of system patching for virtual environment.
67.04	Describe virtual desktops.
67.05	Evaluate the components of networking topology including (servers, network, storage).
67.06	Compare and contrast traditional desktops and servers to virtual counterpart.
67.07	Analyze the hardware requirements to create and scale a virtual infrastructure.
67.08	Compare and contrast traditional virtualization and para-virtualization.
67.09	Identify, describe and use guest operating system in a virtualization environment.
67.10	Identify, define and use virtual machine monitor in virtual environment.

	67.11 Perform virtual partitioning through the Hypervision.
	67.12 Describe bare metal approach for virtualization portioning.
	67.13 Describe hosted virtualization as a virtualization approach.
	67.14 Apply industry standards for hardware support for virtualization.
	67.15 Explain high-level language virtual machines.
	67.16 Describe the benefits of server consolidation and containment acquired through migration to virtualization.
	67.17 Describe the benefits of test and development optimization gained through virtualization.
	67.18 Demonstrate how virtualization reduces cost and complexity of high availability and disaster recovery.
	67.19 Demonstrate how virtualization can enhance security in the enterprise.
68.0	Install and configure the virtualization server platform. The student will be able to:
	68.01 Compare and contrast virtual image to a golden image.
	68.02 Create a virtual image using a virtualization platform using a base operating system.
	68.03 Create a virtual template in which the golden image is configured with the software packages and application.
	68.04 Configure the virtual template to ensure software settings and organizational polices are implemented.
	68.05 Manage inventory objects licenses using the virtual infrastructure ensure to comply with enterprise requirements.
	68.06 Demonstrate how a virtual switch is used to create communication between virtual machines.
	68.07 Perform communication between two virtual machines through the use of a virtual switch.
	68.08 Create, manage and configure virtual switches to enable communication of virtual machines in different hosts.
	68.09 Use virtual system management to remotely manage the allocation in a virtual network.
	68.10 Perform and manage user roles and permission in a virtual environment.
	68.11 Perform server patching on a virtual environment both on traditional servers as well virtual servers.
69.0	Install, configure and manage virtualized clients. The student will be able to:
	69.01 Describe peripheral redirection.
	69.02 Demonstrate proficiency in configuring virtual client to enable both USB and monitor redirection.
	69.03 Compare and contrast the use of peripherals in a traditional and virtual environment.
	69.04 Classify the types of virtual clients used in a virtualization infrastructure.
	69.05 Demonstrate proficiency in performing tasks using thin, thick and mobile virtualization clients.
	69.06 Compare and contrast the performance, ease of use and efficiency of different clients in completing business tasks.

	69.07	Analyze business tasks that are better aligned to a particular virtualization client type.
	69.08	Demonstrate proficiency in managing user sessions and policies of virtual clients.
70.0	Demonstrate proficiency in managing a virtualization infrastructure. The student will be able to:	
	70.01	Describe the process of cloning virtual machines.
	70.02	Identify the benefits of cloning in a virtual infrastructure.
	70.03	Compare and contrast full clones and linked clones.
	70.04	Demonstrate proficiency in identifying situations in which cloning is a proper solution.
	70.05	Demonstrate proficiency in deploying virtual machines using cloning.
	70.06	Describe virtual migration and the situational needs that are required.
	70.07	Identify the role of network bandwidth and resource allocation needed for virtual migration.
	70.08	Describe automating migration to the host server.
	70.09	Identify the process that migration affect virtual disk storage in particular SANS.
	70.10	Demonstrate proficiency in developing action steps to execute a virtual migration.
71.0	Demonstrate an understanding of storage technologies and storage configuration. The student will be able to:	
	71.01	Describe the evolution of storage architecture and data center components.
	71.02	Describe, identify and use data center elements host, connectivity and storage.
	71.03	Identify describe, and use RAID technology in an enterprise environment.
	71.04	Identify the impact to application performance based on RAID implementation.
	71.05	Describe an intelligent storage system.
	71.06	Compare and contrast storage systems for a virtualization infrastructure.
	71.07	Compare and contrast various storage network technologies. (e.g., Fibre Channel Storage Network FC Scan, IP Scan, Fibre Channel over Ethernet, Network Attached Storage, Object Based, Unified Storage)
	71.08	Identify the appropriate storage network solutions based on client requirements.
	71.09	Demonstrate proficiency in creating and managing data stores.
	71.10	Demonstrate proficiency in configuring and managing resource pools.
72.0	Demonstrate proficiency in network optimization using network protocols, ports, and topologies. The student will be able to:	
	72.01	Describe disaster recovery (business continuity) information availability for virtualized and non-virtualized environments.
	72.02	Demonstrate proficiency in backup and recovery in both virtualized and non-virtualized environments.
	72.03	Explain deduplication technology for backup optimization.

	72.04	Identify fixed content storage requirements and archival solutions.
	72.05	Describe continuous data replication and remote replication in virtualized and non-virtualized environments.
	72.06	Demonstrate proficiency in integrating Active Directory to a virtual environment.
	72.07	Demonstrate proficiency in CPU and memory optimization.
	72.08	Demonstrate proficiency using remote desktops and display protocols to optimize network infrastructure.
	72.09	Describe fault tolerance and acceptable levels tolerated based on the infrastructure.
73.0	Understand security in a virtualized environment. The student will be able to:	
	73.01	Compare and contrast hosted and Bare-Metal virtualization implementations vulnerability to threats and attacks.
	73.02	Identify data leakage and malicious code intrusion.
	73.03	Demonstrate proficiency in securing data between guest and host environments.
	73.04	Demonstrate proficiency in managing resource allocation in a virtualized environment to reduce system crash.
	73.05	Demonstrate proficiency in creating images that are secure for client deployment.
	73.06	Identify software security levels and digital signatures.
	73.07	Demonstrate proficiency in using, configuring and managing host firewall in a virtualized infrastructure.
	73.08	Demonstrate proficiency in using command line to configure and manage the host firewall.
	73.09	Demonstrate proficiency in using logging tools to monitor activity in the virtual environment.
	73.10	Identify, describe and provide solutions to threats based on scalability and high availability.
	73.11	Demonstrate proficiency in securing mobile, thin and thick clients.
73.12	Explain threats to network authentication in a virtualized environment.	

Additional Information

Laboratory Activities

Laboratory investigations that include scientific inquiry, research, measurement, problem solving, emerging technologies, tools and equipment, as well as, experimental, quality, and safety procedures are an integral part of this career and technical program/course. Laboratory investigations benefit all students by developing an understanding of the complexity and ambiguity of empirical work, as well as the skills required to manage, operate, calibrate and troubleshoot equipment/tools used to make observations. Students understand measurement error; and have the skills to aggregate, interpret, and present the resulting data. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda (PBL) and Business Professionals of America (BPA) are the co-curricular student organizations providing leadership training and reinforcing specific career and technical skills. Career and Technical Student Organizations provide activities for students as an integral part of the instruction offered.

Cooperative Training – OJT

On-the-job training is appropriate but not required for this program. Whenever offered, the rules, guidelines, and requirements specified in the OJT framework apply.

Basic Skills

In Career Certificate Programs offered for 450 hours or more, in accordance with Rule 6A-10.040, F.A.C., the minimum basic skills grade levels required for postsecondary adult career and technical students to complete this program are: Computation (Mathematics) and Communications (Reading and Language Arts). These grade level numbers correspond to a grade equivalent score obtained on a state designated basic skills examination.

Adult students with disabilities, as defined in Section 1004.02, Florida Statutes, may be exempted from meeting the Basic Skills requirements (Rule 6A-10.040). Students served in exceptional student education (except gifted) as defined in s. 1003.01, F.S., may also be exempted from meeting the Basic Skills requirement. Each school district and Florida College must adopt a policy addressing procedures for exempting eligible students with disabilities from the Basic Skills requirement as permitted in Section 1004.91, F.S.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. 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. Documentation of the accommodations requested and provided should be maintained in a confidential file.

Note: postsecondary curriculum and regulated secondary programs cannot be modified.