Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Cisco Certified Network Associate Certificate**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0611020301
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	Phi Beta Lambda, BPA (Business Professionals of America)
SOC Codes (all applicable)	15-1143 – Computer Network Architect
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to the selection of telecommunications equipment, including the installation and configuration of networks, routers, and switches.

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

Standards

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

01.0 Demonstrate proficiency in network design.
02.0 Demonstrate proficiency in hubs, routers, and switches.

Florida Department of Education
Student Performance Standards

Program Title: **Cisco Certified Network Associate Certificate**
CIP Number: **0611020301**
Program Length: **12 Credit Hours**
SOC Code(s): **15-1143**

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in network design**. –** The student will be able to:
01.01	Explain the OSI model for LAN and WAN communications.
01.02	Apply the OSI model to realistic networking situations.
01.03	Describe the basic LAN topologies and transport methods.
01.04	Explain basic WAN topologies and transport methods.
01.05	Describe the various functions of the principle networking standards organizations.
01.06	Describe various kinds of network media.
01.07	Compare packet and cell implementations and interfaces.
01.08	Explain WAN carrier types for point-to-point, T-carriers, SONET, ISDN, and wireless technologies.
01.09	Describe the purpose of LAN network transmission equipment, including NICs, repeaters, MAUs, hubs, routers, switches, and gateways.
01.10	Explain how LAN network equipment works.
01.11	Describe the purpose of WAN network equipment, including multiplexers, channel banks, private networks, modems, access servers, and routers.
01.12	Explain how WAN network equipment works.
01.13	Design LAN topologies using media and equipment for different kinds of applications.
01.14	Design a LAN to connect to a WAN.
01.15	Discuss WAN topology options according to pricing, bandwidth needs, and equipment needs.
01.16	Explain how video and audio are transported over networks.
01.17	Discuss voice, video, and data transmitted works.
01.18	Explain how multimedia data transmission works.
01.19	Design LANs and WANs for integrated voice, video, and data transmissions.

	01.20 Describe TCP/IP.
	01.21 Explain how TCP and IP are implemented on networks.
	01.22 Explain how UDP is employed with IP.
	01.23 Describe IP addressing and understand how to use it on LANs and WANs.
	01.24 Describe the new IP version 6 and understand how to design it into your expanding network.
	01.25 Discuss and use application protocols in the TCP/IP suite.
	01.26 Explain WAN Transport Methods – X.25, Frame Relay, ISDN, SMDS, DSL, and SONET.
	01.27 Explain ATM Technologies – Characteristics, Layered Communications, and Cell structure.
	01.28 Explain ATM design considerations.
	01.29 Describe ATM topologies.
	01.30 Explain ATM backbone networks.
	01.31 Describe ATM LAN applications.
	01.32 Describe advantages and disadvantages of Network Protocol Architectures.
02.0	Demonstrate proficiency in hubs, routers, and switches**. –** The student will be able to:
	02.01 Identify standalone hubs
	02.02 Discuss the differences between stackable, modular, and intelligent hubs.
	02.03 Explain how to install a hub.
	02.04 Identify how to choose the right hub.
	02.05 Describe the advantage of segmentation.
	02.06 Describe segmentation using bridges, switches, and routers.
	02.07 Name and describe switching methods.
	02.08 Describe network congestion problems in Ethernet networks.
	02.09 Describe the benefits of network segmentation with bridges, switches, and routers.
	02.10 Distinguish between cut-through and store-and-forward LAN switching.
	02.11 Describe the operation of the Spanning Tree Protocol and its benefits.
	02.12 Describe the benefits of virtual LANs.
	02.13 Identify RIP and IGRP routing protocols.
	02.14 Explain the services of separate and integrated multi-protocol routing.
	02.15 Identify routing problems.
	02.16 Identify router features and functions.

02.17 Describe the features and functions of gateways.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and BPA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Network Systems Developer**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0611090104
Program Type	College Credit Certificate (CCC)
Program Length	41 credit hours
CTSO	Phi Beta Lambda, BPA (Business Professionals of America)
SOC Codes (all applicable)	15-1143 – Computer Network Architect
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/ 0615120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to computer systems architecture, software, communications, programming, and analysis and design of computer systems.

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

Standards

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

01.0 Demonstrate proficiency in computer systems architecture.
02.0 Demonstrate proficiency in the use of microcomputer disk operating system services and functions.
03.0 Demonstrate proficiency in structured cabling.
04.0 Demonstrate proficiency in peripheral equipment.
05.0 Demonstrate proficiency in customer site requirements and considerations.
06.0 Demonstrate proficiency in the analysis and design of peripheral equipment used in computer systems.
07.0 Demonstrate proficiency in computer and network security.
08.0 Demonstrate proficiency in hubs, bridges, routers, and switches.
09.0 Demonstrate proficiency in communication interfacing.
10.0 Demonstrate proficiency in customer relations.
11.0 Demonstrate proficiency in computer networking techniques.
12.0 Demonstrate proficiency in analysis and design of data communications system.
13.0 Demonstrate appropriate math skills.
14.0 Demonstrate proficiency in structured cabling.
15.0 Demonstrate proficiency in network troubleshooting.
16.0 Demonstrate proficiency in network design.
17.0 Demonstrate proficiency in wireless devices.

Florida Department of Education
Student Performance Standards

Program Title: **Network Systems Developer**
CIP Number: **0611090104**
Program Length: **41 Credit Hours**
SOC Code(s): **15-1143**

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in computer systems architecture—The student will be able to:
01.01	Draw and explain systems configurations in block detail.
01.02	Interpret computer acronyms.
01.03	Identify and define priorities and interrupts at system level.
01.04	Define and list direct memory access handling systems.
01.05	Define functions of advanced memory techniques (e.g. virtual, pipeline, cache).
01.06	Troubleshoot a microcomputer system.
02.0	Demonstrate proficiency in the use of microcomputer disk operating system services and functions--The student will be able to:
02.01	Describe the historical development of computer operating systems.
02.02	Describe the major hardware and related software subsystem of microcomputer DOS (Disk Operating System).
02.03	Describe various disk formats.
02.04	Describe the extended services of enhanced systems.
02.05	Describe design decisions involved in implementing
02.06	Input/Output (I/O) interfacing using interrupts.
02.07	Program using the extended DOS functions.
02.08	Describe the various operating systems, including Windows 95 and 98, NT 4.0, 2000, Linux, Unix, Novell, etc.
03.0	Demonstrate proficiency in computer operating systems—-The student will be able to:
03.01	Describe types of operating systems.
03.02	Understand the history of operating systems.
03.03	Explain single-tasking versus multitasking.
03.04	Explain single-user versus multi-user operating systems.

03.05	Identify current operating systems.
03.06	Identify computer hardware.
03.07	Identify popular PC processors.
03.08	Explain system architectures.
03.09	Describe various PC operating systems.
03.10	Describe the file system functions.
03.11	Explain the DOS/Windows 3.1 file system.
03.12	Explain Windows 95/98, NT, and 2000 file systems.
03.13	Describe the UNIX file system.
03.14	Discuss the Macintosh file system.
03.15	Discuss the installation of an operating system.
03.16	Identify the preparation for installing an operating system.
03.17	Explain how to install MS-DOS, Windows 3.1, Windows 95/98, Windows NT, and Windows 2000.
03.18	Explain how to install UNIX: Linux.
03.19	Explain how to install Mac OS.
03.20	Identify the steps to upgrade an operating system to a newer version.
03.21	Describe the various output, input, and storage devices.
03.22	Explain the various modems and other devices associated with operating systems.
03.23	Describe the network connectivity associated with various operating systems.
03.24	Explain sharing disks and files through server network operating systems.
03.25	Describe accessing and sharing disks and files through client (workstations) network operating systems.
03.26	Identify how to share printing devices through various operating systems.
03.27	Explain network and internet resource servers.
03.28	Describe file system maintenance.
03.29	Explain finding and deleting files on various operating systems.
03.30	Describe how to maintain large and small system disks.
03.31	Identify the process for making backups.
03.32	Explain how to optimize software installations.
03.33	Identify how to tune an operating system.
04.0	Demonstrate proficiency in peripheral equipment-–The student will be able to:

	04.01 Install, analyze and troubleshoot interface controllers.
	04.02 Install, analyze and troubleshoot display terminals.
	04.03 Install, analyze and troubleshoot printer.
	04.04 Install, analyze and troubleshoot magnetic tape equipment.
	04.05 Install, analyze and troubleshoot disk drive equipment.
	04.06 Define environmental requirements for peripherals and media.
05.0	Demonstrate proficiency in customer site requirements and considerations--The student will be able to:
	05.01 Apply effective customer relations.
	05.02 Follow installation procedures.
	05.03 Calculate and determine power requirements.
	05.04 Calculate and determine environmental requirements.
	05.05 List and perform preventative maintenance techniques and requirements.
06.0	Demonstrate proficiency in the analysis and design of peripheral equipment used in computer systems--The student will be able to:
	06.01 Describe and analyze circuits used in various functions of video display systems.
	06.02 Analyze various types of disk drives and disk drive controllers.
	06.03 Analyze various types of printers and plotters and their related interface controllers.
	06.04 Describe the use of RAM (Random-Access Memory) and ROM (Read-Only Memory) for font generation in video display systems.
	06.05 Modulation and interval timing techniques.
	06.06 Pointing devices for computer systems.
	06.07 Analyze the operation of mechanical and optical pointing devices used in computer systems.
	06.08 Describe the functions of the major blocks in a dot matrix printer.
	06.09 Analyze the communication process using a standard Centronics parallel interface in a printer.
	06.10 Describe the main functional blocks of a roller bed plotter.
	06.11 Analyze subsystems including interfaces for use in a roller bed plotter.
	06.12 Identify the implications of ESD (Electrostatic Discharge).
07.0	Demonstrate proficiency in computer and network security—The student will be able to:
	07.01 Basic understanding of logon, user, file, system, and network security associated with the appropriate operating system.
	07.02 Design a basic security system associated with the appropriate operating system.
	07.03 Analyze a basic security system associated with the appropriate operating system.
	07.04 Troubleshoot a basic security system associated with the appropriate operating system.

08.0	Demonstrate proficiency in hubs, bridges, routers, and switches-–The student will be able to:
08.01	Identify standalone hubs.
08.02	Discuss the differences between stackable, modular, and intelligent hubs.
08.03	Explain how to install a hub.
08.04	Identify how to choose the right hub.
08.05	Describe the advantage of segmentation.
08.06	Describe segmentation using bridges, switches, and routers.
08.07	Name and describe switching methods.
08.08	Describe network congestion problems in Ethernet networks.
08.09	Describe the benefits of network segmentation with bridges, switches, and routers.
08.10	Distinguish between cut-through and store-and-forward LAN switching.
08.11	Describe the operation of the Spanning Tree Protocol and its benefits.
08.12	Describe the benefits of virtual LANs.
08.13	Identify RIP and IGRP routing protocols.
08.14	Explain the services of separate and integrated multiprotocol routing.
08.15	Identify routing problems.
08.16	Identify router features and functions.
08.17	Describe the features and functions of gateways.
09.0	Demonstrate proficiency in communication interfacing--The student will be able to:
09.01	Identify and define serial, parallel, USB, and FireWire interface standards.
09.02	Identify, define and configure sync and async devices.
09.03	Demonstrate the use of interface devices.
09.04	Identify and define networking levels.
09.05	Identify and define protocols.
09.06	Identify and define multi-user systems.
09.07	Troubleshoot and repair network systems.
09.08	Demonstrate the use of a protocol analyzer.
10.0	Demonstrate proficiency in customer relations--The student will be able to:
10.01	Describe effective listening techniques.
10.02	Describe techniques for instilling customer confidence.

	10.03 Describe techniques for keeping the customer informed.
	10.04 Demonstrate proper follow-up techniques.
11.0	Demonstrate proficiency in customer networking techniques—The student will be able to:
	11.01 Identify and define computer networking techniques.
	11.02 Design a system using hardware and software communication protocols.
	11.03 Apply management techniques for network software.
12.0	Demonstrate proficiency in analysis and design of data communication systems--The student will be able to:
	12.01 Describe the different types of digital data communications systems.
	12.02 Describe data formats and transmission rates in serial data communications systems.
	12.03 Identify and define available options for integration of a display terminal in a data communication system.
	12.04 Identify and define communication signals and protocol for MODEM (Modulator Demodulator) links.
	12.05 Apply error detection and correction in digital communication systems.
	12.06 Define communication protocols.
	12.07 Design and apply multiplexing techniques for computer.
13.0	Demonstrate appropriate math skills--The student will be able to:
	13.01 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	13.02 Perform Algebraic formulations.
14.0	Demonstrate proficiency in structured cabling--The student will be able to:
	14.01 Identify and define data cabling.
	14.02 Describe the cabling standards.
	14.03 Identify and describe the correct cabling.
	14.04 Describe the various constraints of cable systems and infrastructures.
	14.05 Describe the various components of a cabling system.
	14.06 Identify and demonstrate the tools utilized in cabling.
	14.07 Describe the different network media and connectors utilized in structure cabling.
	14.08 Analyze and design a structure wiring cabling system.
	14.09 Demonstrate a successful structured wiring installation.
	14.10 Describe and demonstrate testing, as well as troubleshooting techniques in structured cabling.
	14.11 Develop a structure wiring proposal.
15.0	Demonstrate proficiency in network troubleshooting--The student will be able to:

	15.01	Explain LAN standards and the OSI model.
	15.02	Describe the proper method of documenting a network.
	15.03	Identify cable, power line, analog interface, and digital interface testing tools.
	15.04	Identify protocol analyzers.
	15.05	Identify the troubleshooting techniques for various cabling systems.
	15.06	Identify how to troubleshoot Token Ring networks.
	15.07	Identify how to troubleshoot Ethernet networks.
	15.08	Identify how to troubleshoot FDDI networks.
16.0	Demonstrate proficiency in network design—The student will be able to:	
	16.01	Explain the OSI model for LAN and WAN communications.
	16.02	Apply the OSI model to realistic networking situations.
	16.03	Describe the basic LAN topologies and transport methods.
	16.04	Explain basic WAN topologies and transport methods.
	16.05	Describe the various functions of the principle networking standards organizations.
	16.06	Describe various kinds of network media.
	16.07	Compare packet and cell implementations and interfaces.
	16.08	Explain WAN carrier types for point-to-point, T-carriers, SONET, ISDN, and wireless technologies.
	16.09	Describe the purpose of LAN network transmission equipment, including NICs, repeaters, MAUs, hubs, routers, brouters, switches, and gateways.
	16.10	Explain how LAN network equipment works.
	16.11	Describe the purpose of WAN network equipment, including multiplexers, channel banks, private networks, modems, access servers, and routers.
	16.12	Explain how WAN network equipment works.
	16.13	Design LAN topologies using media and equipment for different kinds of applications.
	16.14	Design a LAN to connect to a WAN.
	16.15	Discuss WAN topology options according to pricing, bandwidth needs, and equipment needs.
	16.16	Explain how video and audio are transported over networks.
	16.17	Discuss voice, video, and data integration issues.
	16.18	Explain how multimedia data transmission works.
	16.19	Design LANs and WANs for integrated voice, video, and data transmissions.
	16.20	Describe TCP/IP.

	16.21	Explain how TCP and IP are implemented on networks.
	16.22	Explain how UDP is employed with IP.
	16.23	Describe IP addressing and understand how to use it on LANs and WANs.
	16.24	Describe the new IP version 6 and understand how to design it into your expanding network.
	16.25	Discuss and use application protocols in the TCP/IP suite.
	16.26	Explain WAN Transport Methods – X.25, Frame Relay, ISDN, SMDS, DSL, SONET.
	16.27	Explain ATM Technologies – Characteristics, Layered Communications, Cell structure.
	16.28	Explain ATM design considerations.
	16.29	Describe ATM topologies.
	16.30	Explain ATM backbone networks.
	16.31	Describe ATM LAN applications.
	16.32	Network Protocol Architectures: Advantages and Disadvantages.
17.0	Demonstrate proficiency in wireless devices –The student will be able to:	
	17.01	Describe at least three wireless media such as: radio wave, microwave, and infrared.
	17.02	Describe cellular wireless point-to-point and multipoint topology strategies.
	17.03	Identify the types of wireless networks and the uses of each.
	17.04	Describe the types of signal transmission used in mobile computing such as: packet-radio communication, cellular networks, and satellite stations.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and BPA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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Articulation

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Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Computer Specialist**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0611100604
Program Type	College Credit Certificate (CCC)
Program Length	27 credits hours
CTSO	Phi Beta Lambda, BPA (Business Professionals of America)
SOC Codes (all applicable)	15-1142 - Network and Computer Systems Administrator
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to computer systems architecture and analysis and design of computer systems. This college credit certificate focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the computer engineering industry; technical and product skills, underlying principles of technology, and safety.

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

Standards

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

01.0 Demonstrate proficiency in computer systems architecture.
02.0 Demonstrate proficiency in the use of microcomputer disk operating system services and functions.
03.0 Demonstrate proficiency in computer operating systems.
04.0 Demonstrate proficiency in peripheral equipment.
05.0 Demonstrate proficiency in customer site requirements and considerations.
06.0 Demonstrate proficiency in the analysis and design of peripheral equipment used in computer systems.
07.0 Demonstrate proficiency in computer and network security.
08.0 Demonstrate proficiency in hubs, bridges, routers, and switches.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Specialist**
CIP Number: **0611100604**
Program Length: **27 credit hours**
SOC Code(s): **15-1142**

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in computer systems architecture. – The student will be able to:
01.01	Draw and explain systems configurations in block detail.
01.02	Interpret computer acronyms.
01.03	Identify and define priorities and interrupts at system level.
01.04	Define and list direct memory access handling systems.
01.05	Define functions of advanced memory techniques (e.g. virtual, pipeline, cache).
01.06	Troubleshoot a microcomputer system.
02.0	Demonstrate proficiency in the use of microcomputer disk operating system services and functions. – The student will be able to:
02.01	Describe the historical development of computer operating systems.
02.02	Describe the major hardware and related software subsystem of microcomputer DOS (Disk Operating System).
02.03	Describe various disk formats.
02.04	Describe the extended services of enhanced systems.
02.05	Describe design decisions involved in implementing Input/Output (I/O) interfacing using interrupts.
02.06	Program using the extended DOS functions.
02.07	Describe the various operating systems, including Windows 95 and 98, NT 4.0, 2000, Linux, Unix, Novell, etc.
03.0	Demonstrate proficiency in computer operating systems. – The student will be able to:
03.01	Describe types of operating systems.
03.02	Understand the history of operating systems.
03.03	Explain single-tasking versus multitasking.
03.04	Explain single-user versus multi-user operating systems.
03.05	Identify current operating systems.

03.06	Identify computer hardware.
03.07	Identify popular PC processors.
03.08	Explain system architectures.
03.09	Describe various PC operating systems.
03.10	Describe the file system functions.
03.11	Explain the DOS/Windows 3.1 file system.
03.12	Explain Windows 95/98, NT, and 2000 file systems.
03.13	Describe the UNIX file system.
03.14	Discuss the Macintosh file system.
03.15	Discuss the installation of an operating system.
03.16	Identify the preparation for installing an operating system.
03.17	Explain how to install MS-DOS, Windows 3.1, Windows 95/98, Windows NT, and Windows 2000.
03.18	Explain how to install UNIX: Linux.
03.19	Explain how to install Mac OS.
03.20	Identify the steps to upgrade an operating system to a newer version.
03.21	Describe the various output, input, and storage devices.
03.22	Explain the various modems and other devices associated with operating systems.
03.23	Describe the network connectivity associated with various operating systems.
03.24	Explain sharing disks and files through server network operating systems.
03.25	Describe accessing and sharing disks and files through client (workstations) network operating systems.
03.26	Identify how to share printing devices through various operating systems.
03.27	Explain network and internet resource servers.
03.28	Describe file system maintenance.
03.29	Explain finding and deleting files on various operating systems.
03.30	Describe how to maintain large and small system disks.
03.31	Identify the process for making backups.
03.32	Explain how to optimize software installations.
03.33	Identify how to tune an operating system.
04.0	Demonstrate proficiency in peripheral equipment. – The student will be able to:
04.01	Install, analyze and troubleshoot interface controllers.

	04.02 Install, analyze and troubleshoot display terminals.
	04.03 Install, analyze and troubleshoot printer.
	04.04 Install, analyze and troubleshoot magnetic tape equipment.
	04.05 Install, analyze and troubleshoot disk drive equipment.
	04.06 Define environmental requirements for peripherals and media.
05.0	Demonstrate proficiency in customer site requirements and considerations. – The student will be able to:
	05.01 Apply effective customer relations.
	05.02 Follow installation procedures.
	05.03 Calculate and determine power requirements.
	05.04 Calculate and determine environmental requirements.
	05.05 List and perform preventative maintenance techniques and requirements.
06.0	Demonstrate proficiency in the analysis and design of peripheral equipment used in computer systems. – The student will be able to:
	06.01 Describe and analyze circuits used in various functions of video display systems.
	06.02 Analyze various types of disk drives and disk drive controllers.
	06.03 Analyze various types of printers and plotters and their related interface controllers.
	06.04 Describe the use of RAM (Random-Access Memory) and ROM (Read-Only Memory) for font generation in video display systems.
	06.05 Modulation and interval timing techniques.
	06.06 Pointing devices for computer systems.
	06.07 Analyze the operation of mechanical and optical pointing devices used in computer systems.
	06.08 Describe the functions of the major blocks in a dot matrix printer.
	06.09 Analyze the communication process using a standard Centronics parallel interface in a printer.
	06.10 Describe the main functional blocks of a roller bed plotter.
	06.11 Analyze subsystems including interfaces for use in a roller bed plotter.
	06.12 Identify the implications of ESD (Electrostatic Discharge).
07.0	Demonstrate proficiency in computer and network security. – The student will be able to:
	07.01 Basic understanding of logon, user, file, system, and network security associated with the appropriate operating system.
	07.02 Design a basic security system associated with the appropriate operating system.
	07.03 Analyze a basic security system associated with the appropriate operating system.
	07.04 Troubleshoot a basic security system associated with the appropriate operating system.
08.0	Demonstrate proficiency in hubs, bridges, routers, and switches. – The student will be able to:

08.01	Identify standalone hubs.
08.02	Discuss the differences between stackable, modular, and intelligent hubs.
08.03	Explain how to install a hub.
08.04	Identify how to choose the right hub.
08.05	Describe the advantage of segmentation.
08.06	Describe segmentation using bridges, switches, and routers.
08.07	Name and describe switching methods.
08.08	Describe network congestion problems in Ethernet networks.
08.09	Describe the benefits of network segmentation with bridges, switches, and routers.
08.10	Distinguish between cut-through and store-and-forward LAN switching.
08.11	Describe the operation of the Spanning Tree Protocol and its benefits.
08.12	Describe the benefits of virtual LANs.
08.13	Identify RIP and IGRP routing protocols.
08.14	Explain the services of separate and integrated multiprotocol routing.
08.15	Identify routing problems.
08.16	Identify router features and functions.
08.17	Describe the features and functions of gateways.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and BPA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Technology Support Specialist**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615000007
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours (Primary), 21 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3029 – Engineering Technicians, Except Drafters, All Other
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001). **This certificate program is the core of the Engineering Technology degree program.**

The 18 credit hour technical core has been defined to align with the Manufacturing Skills Standards Council's (MSSC) skills standards. MSSC skill standards define the knowledge, skills, and performance needed by today's frontline manufacturing workers. After completing this core and the General Education requirements, it is anticipated that students will be prepared to pass the MSSC Production Technician Certification.

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, technical competency, safe and efficient work practices and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance and support for engineering design, processes, production, testing, and/or maintaining product quality.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Engineering Technology and Industrial Applications: production materials and processes, quality, computer-aided drafting, electronics, mechanics, instrumentation and safety.

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

Standards

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

01.0 Demonstrate an understanding of industrial processes and material properties.
02.0 Generate and interpret computer-aided drawings.
03.0 Demonstrate a fundamental understanding of electronics and electricity.
04.0 Demonstrate an understanding of industrial safety, health, and environmental requirements.
05.0 Demonstrate proficiently in the use of quality assurance methods and quality control concepts.
06.0 Demonstrate proficiency in using tools, instruments and testing devices.
07.0 Demonstrate basic troubleshooting skills.
08.0 Demonstrate appropriate communication skills.
09.0 Demonstrate appropriate math skills.
10.0 Demonstrate an understanding of modern business practices and strategies.
11.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology Support Specialist**
CIP Number: **0615000007**
Program Length: **18 credit hours**
SOC Code(s): **17-3029**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of industrial processes and materials properties--The student will be able to:
01.01	Demonstrate knowledge of current manufacturing processes.
01.02	Demonstrate knowledge of the use of current manufacturing machines, operating systems and mechanisms.
01.03	Estimate manpower needs and skills needed in assembly operations.
01.04	Demonstrate knowledge of the criteria for tool design, maintenance, procurement and handling.
01.05	Demonstrate knowledge of gage design, usage and limitations.
01.06	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for automated systems.
01.07	Demonstrate knowledge of processes used to ensure that changes do not negatively impact production or product.
01.08	Demonstrate knowledge of production timing to ensure customer satisfaction and on-time delivery.
01.09	Demonstrate knowledge of time and motion to enhance productivity.
01.10	Make continuous adjustments to equipment and procedures that result in improved productivity.
01.11	Demonstrate knowledge of how raw materials are moved.
01.12	Setup or modify new equipment per engineering specifications and documentations.
01.13	Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment on operations.
02.0	Generate and interpret computer-aided drawings--The student will be able to:
02.01	Apply current industrial computer aided-drawing practices.
02.02	Construct geometric figures.
02.03	Create and edit text formatted to industry standards.
02.04	Use and control accuracy-enhancement tools for entity positioning methods.
02.05	Identify, create, store, and use standard part symbols and libraries.
02.06	Control entity properties by layer, color, and line type.

	02.07 Use viewing commands to perform zooming and panning.
	02.08 Use Query commands to interrogate database for entity characteristics.
	02.09 Plot drawings on media using layout and scale.
	02.10 Prepare drawings for flexibility of future editing and minimum file size.
	02.11 Apply standard dimensioning rules.
	02.12 Demonstrate proficiency importing and exporting various files types.
	02.13 Operate related peripheral devices.
	02.14 Read and interpret technical drawings to assure conformity of product.
	02.15 Demonstrate skill in assessing and reading schematics and drawings.
03.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
	03.01 Use appropriate grounding techniques.
	03.02 Demonstrate knowledge of AC/DC theory.
	03.03 Solve circuit problems using unit conversion and scientific notation.
	03.04 Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
	03.05 Solve problems in electric circuits involving work and power.
	03.06 Solve problems involving series and parallel resistance circuits.
	03.07 Solve problems involving capacitance in DC circuits.
	03.08 Solve problems involving magnetic circuits.
	03.09 Solve problems involving inductance in DC circuits.
	03.10 Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
	03.11 Solve problems on factors governing reactance in AC circuits.
	03.12 Solve impedance problems in AC circuits.
	03.13 Prepare and complete concise, neat and accurate lab reports.
04.0	Demonstrate an understanding of safety, health, and environmental requirements--The student will be able to:
	04.01 Communicate any new or revised safety procedures.
	04.02 Update personnel about current safety guidelines.
	04.03 Wear appropriate Personal Protective Equipment (PPE).
	04.04 Follow area-posted safety guidelines.
	04.05 Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA)).
	04.06 Maintain a clean and safe work environment.

	04.07	Maintain personal protection equipment.
	04.08	Report unsafe conditions/practices.
	04.09	Locate emergency exits and alarms.
	04.10	Comply with company-established safety practices.
	04.11	Use appropriate fire fighting procedures.
	04.12	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
	04.13	Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
	04.14	Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
	04.15	Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
	04.16	Demonstrate knowledge of incident reporting procedures.
	04.17	Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
	04.18	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
	04.19	Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.
05.0	Demonstrate proficiency in use of quality assurance methods, quality control concepts--The student will be able to:	
	05.01	Monitor processes for quality.
	05.02	Inspect product for quality.
	05.03	Document quality measurements or observations by filling out quality charts and records.
	05.04	Compare process measurements to standards.
	05.05	Identify root causes using standard techniques.
	05.06	Identify Corrective Action and Preventive Action.
	05.07	Describe the concept of quality assurance in increasing productivity and promoting zero defects.
	05.08	Apply data collection methods for productivity improvement and reporting.
	05.09	Analyze data using tools and techniques for productivity and quality problems.
	05.10	Analyze data using tools and techniques for cause and effect relationships.
	05.11	Develop and apply quality improvement strategies.
	05.12	Demonstrate an understanding of a quality process’s capability and its applications.
	05.13	Demonstrate knowledge of how to implement quality assurance principles and methods.
	05.14	Demonstrate knowledge of quality assurance checks for inspections.
	05.15	Demonstrate an understanding of internal and external supply chains.
	05.16	Demonstrate understanding of the configuration of management.

	05.17 Demonstrate knowledge of standard industry practices regarding inventory control methods and procedures.
	05.18 Demonstrate knowledge of production floor plan and safety requirements to place materials in most efficient and safe location and position.
	05.19 Demonstrate knowledge of storage space available to establish lot sizes and reorder points.
	05.20 Demonstrate knowledge of proper forecasts and methods for conducting inventory audits to recognize and report inventory discrepancies.
	05.21 Identify significant inventory discrepancies.
	05.22 Use cycle count process to ensure accurate counts are taken.
	05.23 Demonstrate knowledge of trade-off techniques (e.g., balance lead time and cycle time issues with inventory).
06.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:
	06.01 Identify and use hand tools properly.
	06.02 Identify and use power tools properly.
	06.03 Use inspection equipment appropriately.
	06.04 Implement appropriate testing regimes.
	06.05 Use appropriate measurement tools (e.g., micrometers, tapes. etc).
	06.06 Use appropriate safety monitoring and testing equipment.
	06.07 Communicate issues with hand sketches.
	06.08 Use electronic measuring equipment and instruments.
	06.09 Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
07.0	Demonstrate basic troubleshooting skills--The student will be able to:
	07.01 Apply troubleshooting and critical thinking skills to define the problem.
	07.02 Identify symptoms and changes in a system.
	07.03 Isolate potential sources/causes of problems.
	07.04 Consult reference materials.
	07.05 Evaluate repair options.
	07.06 Document properly all repairs and adjustments made.
	07.07 Monitor and correct parameters during tests.
	07.08 Estimate and forecast time and resources needed to perform task.
	07.09 Read blueprints, schematics and technical drawings.
	07.10 Modify or adjust equipment per engineering specifications.
	07.11 Analyze process to identify and correct problems, such as bottlenecks.

08.0	Demonstrate appropriate communication skills--The student will be able to:
08.01	Write logical and understandable statements, or phrases, to accurately complete forms commonly used in business and industry.
08.02	Read and understand graphs, charts, diagrams, and common table formats.
08.03	Read and follow written instructions.
08.04	Demonstrate an understanding of; and ability to follow oral instructions.
08.05	Answer and ask questions coherently and concisely.
08.06	Read critically to identify oversights and assumptions.
08.07	Interact with co-workers using appropriate communication tools correctly.
08.08	Demonstrate knowledge of technical language and technical acronyms.
09.0	Demonstrate appropriate math skills--The student will be able to:
09.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
09.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
09.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
09.04	Use different unit systems appropriately.
09.05	Accurately convert between unit systems.
09.06	Read and interpret angle measurements.
09.07	Use scientific and engineering notation appropriately.
09.08	Apply the rules for significant digits properly.
09.09	Solve simple algebraic equations related to the workplace.
10.0	Demonstrate an understanding of modern business practices and strategies--The student will be able to:
10.01	Demonstrate knowledge of modern business practices.
10.02	Demonstrate knowledge of production process to meet business requirements.
10.03	Describe the importance of entrepreneurship to the American economy.
10.04	List the advantages and disadvantages of business ownership.
10.05	Identify the business skills needed to operate a small business efficiently and effectively.
10.06	Demonstrate knowledge of the alignment of a company's business objectives with production goals.
11.0	Demonstrate employability skills--The student will be able to:
11.01	Demonstrate competence in job search and interview techniques.
11.02	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
11.03	Identify and practice acceptable work habits.

11.04	Demonstrate acceptable employee health habits.
11.05	Demonstrate knowledge of the "Right-To-Know Law".
11.06	Work effectively in teams.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Digital Manufacturing Specialist**
Specialization Tract: **Digital Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615000009
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3019 – Drafters, All Other 17-3026 – Industrial Engineering Technicians 17-3027 – Mechanical Engineering Technicians 17-3029 – Engineering Technicians, Except Drafters, All Other 27-1029 – Designers, All Other 51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic 51-4061 – Model Makers, Metal and Plastic 51-9082 – Medical Appliance Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (0615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate proficiency in three-dimensional (3D) digital modeling software packages for product design.
02.0 Demonstrate proficiency in digital engineering applications for product design.
03.0 Demonstrate proficiency in the principles, concepts and applications in digital manufacturing processes.
04.0 Demonstrate proficiency in the principles, concepts and applications in fabrication techniques.
05.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
06.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.

Florida Department of Education
Student Performance Standards

Program Title: **Digital Manufacturing Specialist**
CIP Number: **0615000009**
Program Length: **24 credit hours**
SOC Code(s): **17-3019, 17-3026, 17-3027, 17-3029, 27-1029, 51-4012, 51-4061, 51-9082**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in three-dimensional (3-D) digital modeling software packages for product design–The student will be able to:
01.01	Implement the CAD commands for three-dimensional drawings.
01.02	Implement and apply the CAD three-dimensional coordinate system for three- dimensional objects.
01.03	Use CAD three-dimensional surface commands for 3-dimensional objects.
01.04	Implement and apply basic software utilities for arranging, detailing, and plotting views of an object.
01.05	Create basic building construction, architectural and object designs in three dimensions.
01.06	Align, rotate, and mirror three-dimensional objects.
01.07	Render a three-dimensional model.
01.08	Customize screen, toolbars, and pull down menus.
01.09	Create a new part document and 2-D sketch views of a solid object.
01.10	Apply and edit dimensions on an object.
01.11	Create the standard drawing views to document the design procedures.
01.12	Perform analyses on the computer model and refine the design.
01.13	Measure and calculate properties of parts.
01.14	Enter and save data for an object drawing.
01.15	Create an assembly drawing.
01.16	Define parts of an assembly in a directory.
01.17	Apply basic solid modeling commands.
01.18	Apply orthographic projection principles to drawing’s layouts.
01.19	Plot solid modeling drawings.
01.20	Convert multiple sketches into extruded features.

01.21	Create the desired sketch to document the design procedures.
01.22	Perform analyses on the sketch procedures and refine the sketch design.
01.23	Create multiple parts using components of a design tree.
01.24	Perform advanced mating using multiple parts or sub-assemblies.
01.25	Define the type of analysis of machine elements of a part.
01.26	Combine 11-13 perform and interpret finite element analysis on modeled objects.
01.27	Apply basic drawing concepts to molded parts.
01.28	Create detailed molds or die cavities of parts and assemblies.
01.29	Derive component parts from an edited mold base.
01.30	Choose and apply a type of material to use to render parts.
01.31	Create and insert render parts into the sheet environment of a solid modeling drawing.
02.0	Demonstrate proficiency in digital engineering design fundamentals–The student will be able to:
02.01	Create and execute advanced templates.
02.02	Convert multiple sketches into construction lines.
02.03	Create and use multiple work planes for advanced functions.
02.04	Create and modify bottom up assemblies.
02.05	Create multiple configurations of an individual part.
02.06	Apply basic drawing concepts to molded parts.
02.07	Create basic sheet metal drawings.
02.08	Create two and three-dimensional drawings related to graphic and industrial design.
02.09	Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
02.10	Demonstrate basic design principles of visual and spatial form as applied to products.
02.11	Perform analyses and refine industrial design.
02.12	Apply design features to the two and three dimensional drawings.
02.13	Capture physical 3D objects, and reverse engineer accurate CAD models from 3D scans.
02.14	Describe the theories related to product and systems design.
02.15	Solve elementary problems related to the form and function of objects and structures.
02.16	Describe the fundamentals of material selection for product and system design.
02.17	Conduct a system design identifying the major phases.
02.18	Demonstrate the use of coordinates measuring machines.

	02.19	Demonstrate the use of optical measuring machines.
	02.20	Demonstrate the use of precision hand tools.
	02.21	Perform 1,2 and 3D measurement routines.
	02.22	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from industrial products.
	02.23	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from manufacturing operations.
	02.24	Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
03.0	Demonstrate proficiency in the principles, concepts and applications in digital manufacturing fundamentals–The student will be able to:	
	03.01	Fabricate a part or an assembly using a rapid prototyping machine.
	03.02	Compare the differing properties and characteristics of common materials used for additive manufacturing models.
	03.03	Develop a part using 3D-CAD software.
	03.04	Perform initial part-build setup on a 3D printer.
	03.05	Describe the various additive manufacturing processes.
	03.06	Define the terminology used in additive manufacturing today.
	03.07	Describe the different hardware systems used in the production of prototypes, with emphasis on the specific additive manufacturing machines used in lab activities for this course.
	03.08	Identify and discuss three main categories of additive manufacturing processes, including specific additive manufacturing machine types used in each of the three categories.
	03.09	Describe the procedures for setting up an additive manufacturing process for a part run.
	03.10	Demonstrate skill in the use of measurement tools, and dimensional analysis of additive manufacturing models.
	03.11	Maintain Rapid Prototyping Machines and support equipment in proper working order.
	03.12	Provide post-processing support for the completion of rapid prototype models.
	03.13	Communicate and execute model post process work to meet expectations.
	03.14	Apply learned skills to finish additive manufacturing model projects.
04.0	Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods--The student will be able to:	
	04.01	Understand professionalism in the manufacturing environment.
	04.02	Understand, use and work with precision numbers.
	04.03	Interpret mechanical drawings.
	04.04	Demonstrate the use of geometric dimensioning and tolerancing.
	04.05	Understand materials, and machining processes.
	04.06	Demonstrate the safe and proper use of and the basic adjustments and maintenance for power tools according to the manufacturer’s recommendations.

	04.07	Identify the use and process in part layout.
	04.08	Demonstrate a working knowledge of metal forming equipment.
	04.09	Demonstrate the use of precision steel rulers.
	04.10	Demonstrate the use of oxy – fuel cutting.
	04.11	Demonstrate acceptable methods in tungsten inert gas welding.
	04.12	Demonstrate acceptable methods in gas metal arc welding.
	04.13	Demonstrate acceptable methods to use a dial indicator.
	04.14	Explain the use of a height gauge to measure stock.
	04.15	Demonstrate acceptable methods hand cutting and forming sheet metal.
	04.16	Demonstrate the use of layout sheet metal tools.
	04.17	Demonstrate acceptable methods using micro-counter sinks.
	04.18	Demonstrate acceptable methods of riveting solid rivets.
	04.19	Demonstrate acceptable methods to use an ironworker.
	04.20	Demonstrate acceptable methods using a break and shear.
	04.21	Demonstrate the use of dial calipers.
	04.22	Identify and characterize composite materials and commodities.
	04.23	Identify uses and hazards involved in handling common composite supplies.
	04.24	Demonstrate knowledge of handling composite materials, adhesives, solvents, etc.
	04.25	Identify tools used in composite fabrication and repair.
	04.26	Demonstrate the safe and proper use of and the basic adjustments and maintenance for dust collection equipment according to the manufacturer's recommendations.
	04.27	Set up and apply the use of clamps and vices.
05.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:	
	05.01	Set up and maintain a manual lathe and mill.
	05.02	Demonstrate acceptable processes using a manual lathe and mill.
	05.03	Demonstrate acceptable control of machining processes
	05.04	Identify and define the physics of machine cutting metals.
	05.05	Demonstrate the characteristics of machining cutting tools.
	05.06	Define and identify parameters of cutting tool life.
	05.07	Demonstrate efficient parameters in production processes.
	05.08	Demonstrate the process to drill and layout holes to a specific size.

05.09	Identify baseline machining layout.
05.10	Identify manual machining procedures used in CNC programming.
05.11	Identify grinding machining practices and processes.
05.12	Identify thread types and tooling used in machining.
05.13	Identify metal alloys and their properties in machining.
05.14	Demonstrate job planning procedures in machining.
05.15	Demonstrate procedures to calculate cutting tool speeds and feeds.
05.16	Demonstrate methods for accessing machine RPM.
05.17	Identify coordinate and primary machining axes.
05.18	Define and describe Absolute and incremental coordinates.
05.19	Identify the five CNC drive components.
05.20	Demonstrate rapid travel and interpolation.
05.21	Identify and define industrial machining and turning centers.
05.22	Identify processes for program creation and data management.
05.23	Demonstrate acceptable procedures in starting CNC machines.
05.24	Demonstrate the CNC machine controls for set up and operation.
05.25	Demonstrate acceptable procedures to set up a CNC machining center.
05.26	Demonstrate acceptable procedures to run programs using a CNC machining center.
05.27	Demonstrate acceptable procedures to generate a CNC program.
05.28	Demonstrate acceptable procedures in CNC job planning.
05.29	Identify cutting tools collets and holding fixtures.
05.30	Identify CNC tooling and applications.
05.31	Define CNC programming code words and conventions.
05.32	Define and demonstrate CNC program fixed cycles.
05.33	Explain basic use of CAD/CAM software and processes.
06.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software–The student will be able to:
06.01	Create CAD/CAM geometry for tool path processing.
06.02	Demonstrate procedures to import/export CAD/CAM files.
06.03	Demonstrate contouring using CAM tool path commands.
06.04	Apply pocketing using CAM tool path commands.

06.05	Demonstrate drill cycles using CAM tool path commands.
06.06	Demonstrate thread cycles using CAM tool path commands.
06.07	Demonstrate engraving using CAM tool path commands.
06.08	Construct lettering using CAM tool path commands.
06.09	Demonstrate nesting using CAM tool path commands.
06.10	Describe procedures for CAM post-processing.
06.11	Apply tool path verification for a CAM program.
06.12	Apply job set-up procedures for a CAM program.
06.13	Demonstrate ability to save, copy, delete, and rename computer files with Windows-based programs.
06.14	Create a CNC machining working portfolio.
06.15	Demonstrate the use of back plotting in a CAM program.
06.16	Demonstrate how to modify an existing tool path.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Rapid Prototyping Specialist**
Specialization Tract: **Digital Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615000012
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3013 – Mechanical Drafters 17-3019 – Drafters, All Other 17-3026 – Industrial Engineering Technicians 17-3027 – Mechanical Engineering Technicians 17-3029 – Engineering Technicians, Except Drafters, All Other 27-1029 – Designers, All Other 51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic 51-4061 – Model Makers, Metal and Plastic 51-9082 – Medical Appliance Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (0615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate proficiency in three-dimensional (3D) digital modeling software packages for product design.
02.0 Demonstrate proficiency in the principles, concepts and applications in digital manufacturing processes.
03.0 Demonstrate proficiency in digital engineering applications for product design.

Florida Department of Education
Student Performance Standards

Program Title: **Rapid Prototyping Specialist**
CIP Number: **0615000012**
Program Length: **12 credit hours**
SOC Code(s): **17-3013, 17-3019, 17-3026, 17-3027, 17-3029, 27-1029, 51-4012, 51-4061, 51-9082**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in three-dimensional (3-D) digital modeling software packages for product design–The student will be able to:
01.01	Implement the CAD commands for three-dimensional drawings.
01.02	Implement and apply the CAD three-dimensional coordinate system for three-dimensional objects.
01.03	Use CAD three-dimensional surface commands for 3-dimensional objects.
01.04	Implement and apply basic software utilities for arranging, detailing, and plotting views of an object.
01.05	Create basic building construction, architectural and object designs in three dimensions.
01.06	Align, rotate, and mirror three-dimensional objects.
01.07	Render a three-dimensional model.
01.08	Customize screen, toolbars, and pull down menus
01.09	Create a new part document and 2-D sketch views of a solid object.
01.10	Apply and edit dimensions on an object.
01.11	Create the standard drawing views to document the design procedures.
01.12	Perform analyses on the computer model and refine the design.
01.13	Measure and calculate properties of parts.
01.14	Enter and save data for an object drawing.
01.15	Create an assembly drawing.
01.16	Define parts of an assembly in a directory.
01.17	Apply basic solid modeling commands.
01.18	Apply orthographic projection principles to drawing’s layouts.
01.19	Plot solid modeling drawings
01.20	Convert multiple sketches into extruded features.

01.21	Create the desired sketch to document the design procedures
01.22	Perform analyses on the sketch procedures and refine the sketch design.
01.23	Create multiple parts using components of a design tree.
01.24	Perform advanced mating using multiple parts or sub-assemblies.
01.25	Define the type of analysis of machine elements of a part.
01.26	Create and insert render parts into the sheet environment of a solid modeling drawing.
01.27	Apply basic drawing concepts to molded parts.
01.28	Create detailed molds or die cavities of parts and assemblies.
01.29	Derive component parts from an edited mold base.
01.30	Choose and apply a type of material to use to render parts.
01.31	Combine 11-13 perform and interpret finite element analysis on modeled objects.
02.0	Demonstrate proficiency in digital engineering applications for product design–The student will be able to:
02.01	Create and execute advanced templates.
02.02	Convert multiple sketches into construction lines.
02.03	Create and use multiple work planes for advanced functions.
02.04	Create and modify bottom up assemblies.
02.05	Create multiple configurations of an individual part.
02.06	Apply basic drawing concepts to molded parts.
02.07	Create basic sheet metal drawings.
02.08	Create two and three-dimensional drawings related to graphic and industrial design.
02.09	Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
02.10	Demonstrate basic design principles of visual and spatial form as applied to products.
02.11	Perform analyses and refine industrial design.
02.12	Apply design features to the two and three dimensional drawings.
02.13	Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
02.14	Describe the theories related to product and systems design.
02.15	Solve elementary problems related to the form and function of objects and structures.
02.16	Describe the fundamentals of material selection for product and system design.
02.17	Conduct a system design identifying the major phases.
02.18	Capture physical 3D objects, and reverse engineer accurate CAD models from 3D scans

	02.19	Demonstrate the use of optical measuring machines.
	02.20	Demonstrate the use of precision hand tools.
	02.21	Perform 1, 2 and 3D measurement routines.
	02.22	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from industrial products.
	02.23	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from manufacturing operations.
	02.24	Demonstrate the use of coordinates measuring machines.
03.0	Demonstrate proficiency in the principles, concepts and applications in digital manufacturing processes–The student will be able to:	
	03.01	Fabricate a part or an assembly using a rapid prototyping machine.
	03.02	Compare the differing properties and characteristics of common materials used for additive manufacturing models.
	03.03	Develop a part using 3D-CAD software.
	03.04	Perform initial part-build setup on a 3D printer.
	03.05	Describe the different hardware systems used in the production of prototypes, with emphasis on the specific additive manufacturing machines used in lab activities for this course.
	03.06	Define the terminology used in additive manufacturing today.
	03.07	Describe the various additive manufacturing processes.
	03.08	Identify and discuss three main categories of additive manufacturing processes, including specific additive manufacturing machine types used in each of the three categories.
	03.09	Describe the procedures for setting up an additive manufacturing process for a part to run.
	03.10	Demonstrate skill in the use of measurement tools, and dimensional analysis of additive manufacturing models.
	03.11	Maintain rapid prototyping machines and support equipment in proper working order.
	03.12	Provide post-processing support for the completion of rapid prototype models.
	03.13	Communicate and execute model post process work to meet expectations.
	03.14	Apply learned skills to finish additive manufacturing model projects.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Mechatronics**
Specialization Tract: **Advanced Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615000013
Program Type	College Credit Certificate (CCC)
Program Length	30 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3024 – Electro-Mechanical Technicians 17-3027 – Mechanical Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to instruction in maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate an understanding of industrial processes and material properties.
02.0 Generate and interpret computer-aided drawings.
03.0 Demonstrate a fundamental understanding of electronics and electricity.
04.0 Demonstrate an understanding of industrial safety, health, and environmental requirements.
05.0 Demonstrate proficiency in using tools, instruments and testing devices.
06.0 Demonstrate basic troubleshooting skills.
07.0 Demonstrate appropriate communication skills.
08.0 Demonstrate appropriate math skills.
09.0 Understand, operate, troubleshoot, and maintain pneumatic, hydraulic, and electromechanical components and/or systems.
10.0 Operate industrial automation systems.
11.0 Troubleshoot industrial automation systems.
12.0 Apply the principles of robotics to automated systems.
13.0 Use proficiently human machine interfaces to operate automated systems.

Florida Department of Education
Student Performance Standards

Program Title: **Mechatronics**
CIP Number: **0615000013**
Program Length: **30 credit hours**
SOC Code(s): **17-2024, 17-3027**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of industrial processes and materials properties--The student will be able to:
01.01	Demonstrate knowledge of current manufacturing processes.
01.02	Demonstrate knowledge of the use of current manufacturing machines, operating systems and mechanisms.
01.03	Estimate manpower needs and skills needed in assembly operations.
01.04	Demonstrate knowledge of the criteria for tool design, maintenance, procurement and handling.
01.05	Demonstrate knowledge of gauge design, usage and limitations.
01.06	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for automated systems.
01.07	Demonstrate knowledge of processes used to ensure that changes do not negatively impact production or product.
01.08	Demonstrate knowledge of production timing to ensure customer satisfaction and on-time delivery.
01.09	Demonstrate knowledge of time and motion to enhance productivity.
01.10	Make continuous adjustments to equipment and procedures that result in improved productivity.
01.11	Demonstrate knowledge of how raw materials are moved.
01.12	Setup or modify new equipment per engineering specifications and documentation.
01.13	Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment on operations.
02.0	Generate and interpret computer-aided drawings--The student will be able to:
02.01	Apply current industrial computer aided-drawing practices.
02.02	Construct geometric figures.
02.03	Create and edit text formatted to industry standards.
02.04	Use and control accuracy-enhancement tools for entity-positioning methods.
02.05	Identify, create, store, and use standard part symbols and libraries.
02.06	Control entity properties by layer, color, and line type.

	02.07 Use viewing commands to perform zooming and panning.
	02.08 Use Query commands to interrogate database for entity characteristics.
	02.09 Plot drawings on media using layout and scale.
	02.10 Prepare drawings for flexibility of future editing and minimum file size.
	02.11 Apply standard dimensioning rules.
	02.12 Demonstrate proficiency importing and exporting various files types.
	02.13 Operate related peripheral devices.
	02.14 Read and interpret technical drawings to assure conformity of product.
	02.15 Demonstrate skill in assessing and reading schematics and drawings.
03.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
	03.01 Use appropriate grounding techniques.
	03.02 Demonstrate knowledge of AC/DC theory.
	03.03 Solve circuit problems using unit conversion and scientific notation.
	03.04 Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
	03.05 Solve problems in electric circuits involving work and power.
	03.06 Solve problems involving series and parallel resistance circuits.
	03.07 Solve problems involving capacitance in DC circuits.
	03.08 Solve problems involving magnetic circuits.
	03.09 Solve problems involving inductance in DC circuits.
	03.10 Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
	03.11 Solve problems on factors governing reactance in AC circuits.
	03.12 Solve impedance problems in AC circuits.
	03.13 Prepare and complete concise, neat and accurate lab reports.
04.0	Demonstrate an understanding of safety, health, and environmental requirements--The student will be able to:
	04.01 Communicate any new or revised safety procedures.
	04.02 Update personnel about current safety guidelines.
	04.03 Wear appropriate Personal Protective Equipment (PPE).
	04.04 Follow area-posted safety guidelines.
	04.05 Demonstrate knowledge of, and follow applicable safety laws and regulations. (e.g., Occupational Safety and Health Administration (OSHA)).
	04.06 Maintain a clean and safe work environment.

	04.07	Maintain personal protection equipment.
	04.08	Report unsafe conditions/practices.
	04.09	Locate emergency exits and alarms.
	04.10	Comply with company-established safety practices.
	04.11	Use appropriate firefighting procedures.
	04.12	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
	04.13	Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
	04.14	Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
	04.15	Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
	04.16	Demonstrate knowledge of incident reporting procedures.
	04.17	Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
	04.18	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
	04.19	Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.
05.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:	
	05.01	Identify and use hand tools properly.
	05.02	Identify and use power tools properly.
	05.03	Use inspection equipment appropriately.
	05.04	Implement appropriate testing regimes.
	05.05	Use appropriate measurement tools (e.g., micrometers, tapes. etc.).
	05.06	Use appropriate safety monitoring and testing equipment.
	05.07	Communicate issues with hand sketches.
	05.08	Use electronic measuring equipment and instruments.
	05.09	Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
06.0	Demonstrate basic troubleshooting skills--The student will be able to:	
	06.01	Apply troubleshooting and critical thinking skills to define the problem.
	06.02	Identify symptoms and changes in a system.
	06.03	Isolate potential sources/causes of problems.
	06.04	Consult reference materials.
	06.05	Evaluate repair options.
	06.06	Document properly all repairs and adjustments made.

	06.07 Monitor and correct parameters during tests.
	06.08 Estimate and forecast time and resources needed to perform task.
	06.09 Read blueprints, schematics and technical drawings.
	06.10 Modify or adjust equipment per engineering specifications.
	06.11 Analyze processes to identify and correct problems, such as bottlenecks.
07.0	Demonstrate appropriate communication skills--The student will be able to:
	07.01 Write logical and understandable statements, or phrases, to accurately complete forms commonly used in business and industry.
	07.02 Read and understand graphs, charts, diagrams, and common table formats.
	07.03 Read and follow written instructions.
	07.04 Demonstrate an understanding of; and ability to follow oral
	07.05 Answer and ask questions coherently and concisely.
	07.06 Read critically to identify oversights and assumptions.
	07.07 Interact with co-workers using appropriate communication tools correctly.
	07.08 Demonstrate knowledge of technical language and technical acronyms.
08.0	Demonstrate appropriate math skills--The student will be able to:
	08.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	08.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	08.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	08.04 Use different unit systems appropriately.
	08.05 Accurately convert between unit systems.
	08.06 Read and interpret angle measurements.
	08.07 Use scientific and engineering notation appropriately.
	08.08 Apply the rules for significant digits properly.
	08.09 Solve simple algebraic equations related to the workplace.
09.0	Understand, operate, troubleshoot, and maintain pneumatic, hydraulic and electromechanical components and/or systems--The student will be able to:
	09.01 Identify, classify and describe the function of pneumatic, hydraulic and electrical machines and components.
	09.02 Construct flow diagrams of pneumatic, hydraulic, and electromechanical systems.
	09.03 Perform basic operation maintenance of pneumatic, hydraulic and electromechanical components, devices and/or machines.

	09.04	Understand maintenance requirements.
	09.05	Troubleshoot errors, faults, and inconsistencies in pneumatic, hydraulic and electromechanical components, machines and/or systems.
	09.06	Define special applications of electromechanical, hydraulic and pneumatic machines and devices used in processing sheet metal, metal cutting processing, plastics, food and beverages, injection molding, thermal molding and bulk processing equipment.
	09.07	Describe important limitations of electromechanical, pneumatic and hydraulic machinery.
	09.08	Operate independent pneumatic, hydraulic and electrical machines properly.
	09.09	Describe the important operating parameters of pneumatic, hydraulic and electrical machines and/systems.
	09.10	Identify and use appropriate monitoring gages for pneumatic, hydraulic, and electromechanical machines and/or systems.
	09.11	Use safe practices while operating, troubleshooting and maintaining industrial equipment.
10.0	Operate industrial automation systems--The student will be able to:	
	10.01	Read and understand schematic diagrams.
	10.02	Chart and analyze ladder logic diagrams for industrial automation systems.
	10.03	Identify Programmable Logic Controller input and output module locations.
	10.04	Match wiring harness identification to program addresses for input and output modules.
	10.05	Identify active and passive states of each module.
	10.06	Interpret flow charts to match field device components with the real devices.
	10.07	Identify when a programmable controller is in run or program mode, or is in a fault condition.
	10.08	Integrate control systems and equipment with production and production support mechanisms.
	10.09	Establish routine operations involving maintenance schedules.
	10.10	Troubleshoot problems and perform minor repairs to industrial automation systems.
	10.11	Integrate control systems and equipment with production and production support mechanisms.
	10.12	Demonstrate automatic inventory accounting related monitoring and control systems.
	10.13	Implement automatic tracking of materials and products using bar codes, machine vision and sensing, and/or infrared technologies.
11.0	Troubleshoot industrial automation systems--The student will be able to:	
	11.01	Demonstrate troubleshooting techniques to identify root cause, errors and faults of a problem.
	11.02	Isolate systems for troubleshooting.
	11.03	Develop a strategy for making system improvements based on troubleshooting activities with strong focus on fail-safing.
	11.04	Identify needed expertise to address the issue.
	11.05	Participate in troubleshooting and resolution teams effectively.
12.0	Apply the principles of robotics to automated systems--The student will be able to:	

	12.01 Define the essential components of a robotic system.
	12.02 Choose appropriate robotic equipment for specific tasks.
	12.03 Describe methods of moving robotic parts.
	12.04 Choose and implement appropriate sensors for robotic applications.
	12.05 Choose and install appropriate actuators for robotic applications.
	12.06 Program robotic devices for restricted movements.
13.0	Use proficiently human machine interfaces to operate automated systems--The student will be able to:
	13.01 Match computer graphic icons to real field equipment
	13.02 Route data flow between computer and controlled machines.
	13.03 Identify computer input and output signals and equipment destinations.
	13.04 Implement manual override appropriately.
	13.05 Perform computer based system and/or machine troubleshooting.
	13.06 Define the essential components of an integrated HMI system.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Industrial Energy Efficiency Specialist**
Specialization Tract: **Industrial Energy Efficiency**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615000014
Program Type	College Credit Certificate (CCC)
Program Length	21 credit hours (Primary), 24 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	13-1199 – Business Operations Specialists, All Other
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to standards and certifications surrounding energy efficiency in industrial or commercial environments, and the methods to evaluate, calculate, implement and troubleshoot components and systems to improve energy efficiency in those environments.

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

Standards

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

01.0 Demonstrate proficiency in using tools, instruments and testing devices.
02.0 Evaluate energy efficiency strategies and methodologies used for industrial/commercial systems.
03.0 Collect appropriate data to determine energy efficiency of industrial/commercial systems.
04.0 Implement efficient operation of industrial/commercial system components.
05.0 Implement energy efficiency strategies in industrial/commercial systems.
06.0 Troubleshoot integrated industrial/commercial utility equipment systems.

Florida Department of Education
Student Performance Standards

Program Title: **Industrial Energy Efficiency Specialist**
CIP Number: **0615000014**
Program Length: **21 credit hours (Primary), 24 credit hours (Secondary)**
SOC Code(s): **13-1199**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:
01.01	Use tools to analyze and track energy data.
01.02	Identify and use hand tools properly.
01.03	Identify and use power tools properly.
01.04	Implement appropriate testing regimes.
01.05	Use appropriate measurement tools (e.g., micrometers, tapes. etc).
01.06	Communicate issues with hand sketches.
01.07	Use electronic measuring equipment and instruments.
01.08	Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
02.0	Evaluate energy efficiency strategies and methodologies used for industrial/commercial systems--The student will be able to:
02.01	Explain the application of cost and energy efficiency in industrial/commercial facilities.
02.02	Identify major energy-using systems in industrial/commercial facilities.
02.03	Explain energy cost control and emission reduction measures.
02.04	Describe the sources of energy appropriate to specific operational processes.
02.05	Determine the power needs and use of industrial/commercial systems.
02.06	Examine codes, standards, programs and certification requirements related to energy efficiency (ie: ASHRAE, LEED, CEM, ISO 50001).
02.07	Interpret energy use and generation.
02.08	Calculate payback period, energy savings, lifecycle cost savings, and utilize incremental analysis for alternative selection.
02.09	Discuss the role of smart grid technologies in energy conservation.
02.10	Define an energy audit/assessment process.
02.11	Define Factory Acceptance Testing, Commissioning, Re/Retro/Continuous Commissioning.

	02.12	Use appropriate audit techniques for the assessment.
	02.13	Identify the energy consuming components of industrial/commercial systems.
	02.14	Explain assessment methods for final control elements in industrial/commercial systems.
	02.15	Compare audit and assessment methods
03.0	Collect appropriate data to determine energy efficiency of industrial/commercial systems--The student will be able to:	
	03.01	Formulate a process for acquiring and recording data.
	03.02	Identify needed data.
	03.03	Interpret sensor data collected from the appropriate instrumentation.
	03.04	Report data in an appropriate format and form.
	03.05	Create an energy and carbon balance accounting report.
	03.06	Determine significant energy uses.
	03.07	Determine operating parameters of major industrial equipment, including motors, fans and pumps.
	03.08	Measure operating parameters of major industrial equipment, including motors, fans and pumps.
	03.09	Interpret psychometric charts, fan curves, pump and valve curves, and equipment performance curves.
	03.10	Use hand instrumentation, advanced instrumentation with data logging capability, thermal imaging test equipment and data loggers.
	03.11	Gather data from plant systems including smart meters, totalizators, equipment controls, plant automation systems (PLC's), and Building and Enterprise Systems (BAS and DCS).
	03.12	Demonstrate calibration of test equipment and field sensors.
	03.13	Discuss energy data reliability in terms of accuracy, precision and repeatability.
	03.14	Determine the impact of weather and other variables on energy usage.
04.0	Implement efficient operation of industrial/commercial system components--The student will be able to:	
	04.01	Evaluate efficient and expected operation of motors, fans, pumps, compressed air, pneumatics, hydraulics, refrigeration, HVAC, process cooling and heating, boilers, steam, lighting, building envelope.
	04.02	Describe duct/pipe insulation options and uses.
	04.03	Use leak detection equipment.
	04.04	Determine the proper size for equipment (motors, pumps, fan's, compressed air, process cooling and heating, etc.)
	04.05	Determine optimum operating parameters for equipment and systems (efficiency curves and part load characteristics).
	04.06	Configure variable frequency drives.
	04.07	Configure control systems including open and closed loop control.
	04.08	Demonstrate proper maintenance practices for utility systems for energy efficiency.
	04.09	Determine energy efficient locations of industrial/commercial systems components.

	04.10 Discuss selection, operation and integration of various lighting systems option.
	04.11 Program industrial equipment for energy efficient operation (intelligent controls, VFD, PLC, HVAC controls, etc.)
05.0	Implement energy efficiency strategies in industrial/commercial systems--The student will be able to:
	05.01 Identify current programs for energy reduction.
	05.02 Identify lean principle applications for industrial/commercial systems.
	05.03 Identify lean tools for industrial/commercial systems.
	05.04 Perform an industrial/commercial energy audit.
	05.05 Analyze an energy management plan.
	05.06 Execute a measurement and verification protocol (IPMVP) to measure, verify and validate energy savings.
06.0	Troubleshoot integrated industrial/commercial utility equipment systems--The student will be able to:
	06.01 Discuss typical performance troubleshooting issues of integrated systems.
	06.02 Inspect equipment for real and potential energy losses and optimal performance.
	06.03 Examine equipment operation/controls for real and potential energy losses and optimal performance.
	06.04 Determine appropriate troubleshooting strategies for various industrial/commercial equipment systems.
	06.05 Monitor industrial communication to troubleshoot equipment and systems.
	06.06 Interpret industrial protocols to troubleshoot equipment and systems.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Electronics Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615030309
Program Type	College Credit Certificate (CCC)
Program Length	31 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to DC circuits, AC circuits, solid-state devices, analog circuits, and digital circuits. Integrated into this content will be communications skills, leadership skills, human relations skills, employability skills, safe and efficient work practices, use of circuit diagrams and schematics, soldering, laboratory practices and technical recording and reporting. This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Electronics Engineering industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits.
03.0 Demonstrate proficiency in alternating current (AC) circuits.
04.0 Demonstrate proficiency in solid-state devices.
05.0 Demonstrate proficiency in analog and linear integrated circuits.
06.0 Demonstrate proficiency in digital circuits.
07.0 Demonstrate proficiency in technical recording and reporting.
08.0 Demonstrate proficiency in advanced direct current (DC) circuit network analysis.
09.0 Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis.
10.0 Demonstrate proficiency in design and analysis of discrete solid-state circuits.

Florida Department of Education
Student Performance Standards

Program Title: **Electronics Technician**
CIP Number: **0615030309**
Program Length: **31 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply Occupational Safety Health Administration (OSHA) safety standards in an electronics laboratory environment.
01.02	Make electrical wire connections to create a functional circuit.
01.03	Identify and use electrical/electronic hand and power tools (wire stripper, wire needle-nose clipper, solder and desolder station, etc.).
01.04	Explain the theoretical concepts of soldering.
01.05	Identify non-functional solder connections.
01.06	Practice acceptable soldering, de-soldering, rework, and repair techniques.
01.07	Practice electrostatic discharge (ESD) safety procedures.
01.08	Describe the construction of printed circuit boards (PCBs).
01.09	Use circuit simulation programs to solve problems, verify circuit functionality and design circuits.
01.10	Demonstrate the use of instrumentation and module analytical software.
01.11	Read and interpret data sheet specifications for electronic components.
01.12	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
01.13	Use digital multi-meters (DMM), oscilloscopes, function generators, and power supplies to build, analyze and trouble shoot electrical/electronic circuits.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Describe the physical laws that govern electricity and magnetism.
02.02	Identify sources of electricity.
02.03	Define voltage, current, resistance, power and energy.
02.04	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.05	Read and interpret color codes and symbols to identify electrical components and values.

02.06	Measure properties of a circuit using Digital Multimeter (DMM) and oscilloscopes.
02.07	Calculate and measure the conductance and resistance of conductors and insulators.
02.08	Solve problems in electronics utilizing metric prefixes.
02.09	Apply Ohm's law and Kirchoff's voltage and current laws to solve series, parallel, and series-parallel circuits.
02.10	Construct and verify operation of series, parallel, and series-parallel circuits.
02.11	Analyze and troubleshoot series, parallel, and series-parallel circuits.
02.12	Apply Ohm's law and Kirchoff's voltage and current laws to bridge circuits.
02.13	Construct and verify the operation of bridge circuits.
02.14	Analyze and troubleshoot bridge circuits.
02.15	Identify and define voltage divider circuits (loaded and unloaded).
02.16	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.17	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.18	Apply maximum power transfer theory to determine the conditions under which maximum power transfer occurs in a circuit.
02.19	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.20	Describe magnetic properties of circuits and devices.
02.21	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
02.22	Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in alternating current (AC) circuits–The student will be able to:
03.01	Use trigonometry to solve AC circuits.
03.02	Identify properties of an AC signal.
03.03	Identify AC sources.
03.04	Analyze and measure AC signals utilizing DMM's, oscilloscope, frequency counter and function generator.
03.05	Define the characteristics of AC capacitive and inductive circuits.
03.06	Construct and verify the operation of AC capacitive and inductive circuits.
03.07	Analyze and troubleshoot AC capacitive and inductive circuits.
03.08	Define and apply the principles of transformers to AC circuits.
03.09	Construct and verify the operation of AC circuits utilizing transformers.
03.10	Analyze and troubleshoot AC circuits utilizing transformers.
03.11	Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constants.
03.12	Compute the impedance of passive RC, RL, and RLC circuits.

03.13	Analyze and troubleshoot passive differentiator and integrator circuits.
03.14	Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
03.15	Construct and verify the operation of RLC circuits (series, parallel and complex).
03.16	Define the characteristics of series and parallel resonant circuits.
03.17	Construct and verify the operation of series and parallel resonant circuits.
03.18	Analyze and troubleshoot R-C, R-L and RLC circuits.
03.19	Define the characteristics of frequency selective filter circuits.
03.20	Construct and verify the operation of frequency selective filter circuits.
03.21	Analyze and troubleshoot frequency selective filter circuits.
03.22	Define the characteristics of three-phase circuits.
03.23	Define basic motor theory and operation.
03.24	Define basic generator theory and operation.
03.25	Setup and operate power supplies for AC circuits.
03.26	Analyze and measure power in AC circuits.
03.27	Define power factor and power factor correction in AC circuits.
04.0	Demonstrate proficiency in solid-state devices–The student will be able to:
04.01	Identify and define properties of semiconductor materials.
04.02	Identify and define operating characteristics and applications of junction diodes.
04.03	Identify and define operating characteristics and applications of special diodes, such as varactor diodes, LED, Zener diodes, etc.
04.04	Construct diode circuits.
04.05	Analyze and troubleshoot diode circuits.
04.06	Identify and define operating characteristics and applications of bipolar junction transistors (BJT).
04.07	Identify and define operating characteristics and applications of field effect transistors (FET).
04.08	Identify and define operating characteristics and applications of single-stage amplifiers.
04.09	Construct single-stage amplifiers.
04.10	Analyze and troubleshoot single-stage amplifiers.
04.11	Identify and define operating characteristics and applications of thyristor circuits.
04.12	Construct thyristor circuitry.
04.13	Analyze and troubleshoot thyristor circuitry.
04.14	Demonstrate proficiency in the use of curve tracers and/or transistor testers.

05.0	Demonstrate proficiency in analog and linear integrated circuits –The student will be able to:
05.01	Identify and define operating characteristics and applications of unregulated, linear, or switch-mode power supplies and basic passive filters.
05.02	Construct, analyze, and troubleshoot unregulated power supplies and basic passive filters.
05.03	Identify and define operating characteristics and applications of differential amplifiers including operational amplifiers.
05.04	Construct, analyze, and troubleshoot differential and operational amplifier circuits.
05.05	Identify and analyze different amplifier classes and their applications.
05.06	Construct, analyze, and troubleshoot different amplifier classes.
05.07	Identify and define characteristics of power amplifiers including audio power amplifiers.
05.08	Solve problems in heat sinking and power limitations for audio frequency power amplifiers.
05.09	Construct, analyze and troubleshoot power amplifier circuits including audio power amplifiers.
05.10	Identify and define operating characteristics of power supply regulator circuits.
05.11	Construct, analyze and troubleshoot power supply regulator circuits.
05.12	Identify and define operating characteristics of linear integrated circuits especially operational amplifiers, including time and frequency responses.
05.13	Construct, analyze and troubleshoot operational amplifier circuits including active filters, sinusoidal and non-sinusoidal oscillators, negative and positive feedback circuits, phase shift circuits, phase-locked loop circuits, integrator, and differentiator circuits.
05.14	Select the integrated circuit (IC) appropriate to the defined parameters of a circuit.
05.15	Identify and define operating characteristics and applications of optoelectronic devices i.e. opto-isolators, IR receivers, etc.
05.16	Construct, analyze and troubleshoot optoelectronic circuits.
05.17	Describe fundamental concepts of modulation and demodulation.
05.18	Identify, define, construct, analyze and troubleshoot operating characteristics and applications of linear /non-linear integrated circuits/amplifier circuits.
06.0	Demonstrate proficiency in digital circuits–The student will be able to:
06.01	Define and apply numbering systems to codes and arithmetic operations.
06.02	Analyze and minimize logic circuits using Boolean and Karnaugh Map (K-Map) operations.
06.03	Demonstrate proficiency in the use of logic probes for digital circuits.
06.04	Describe the various logic families and their electrical characteristics, i.e., transistor-transistor logic (TTL), Complimentary Metal-Oxide Semiconductor (CMOS), etc.
06.05	Use pulsers/pulse generators/clock signals to drive the inputs of digital circuits.
06.06	Use oscilloscopes to analyze and troubleshoot digital circuits.
06.07	Use logic analyzers to analyze and troubleshoot digital circuits.
06.08	Determine the fan-out of digital circuits based on IC limitations.

	06.09 List the various types of logic gates and their truth tables.
	06.10 Construct combinational logic circuits using integrated circuits.
	06.11 Troubleshoot combinational and sequential logic circuits.
	06.12 Identify and analyze types of flip-flops and their truth tables.
	06.13 Construct flip-flops using integrated circuits.
	06.14 Troubleshoot flip-flop circuits.
	06.15 Identify types of registers and counters.
	06.16 Construct registers and counters using flip-flops and logic gates.
	06.17 Troubleshoot registers and counters.
	06.18 Analyze, construct, and troubleshoot clock and timing circuits.
	06.19 Identify, construct, and troubleshoot adder/subtractor logic circuits.
	06.20 Identify, construct, and troubleshoot encoders and decoders.
	06.21 Identify, construct, and troubleshoot multiplexer and demultiplexer circuits.
	06.22 Identify types of memory circuits.
	06.23 Describe and examine the uses of digital-to-analog and analog-to-digital conversions.
	06.24 Construct and troubleshoot digital-to-analog and analog-to-digital circuits.
	06.25 Identify, construct, and troubleshoot digital display circuits.
	06.26 Identify and apply Programmable Logic Device (PLD) concepts to logic devices.
07.0	Demonstrate proficiency in technical recording and reporting–The student will be able to:
	07.01 Use computer application programs (e.g. word processor, database, spreadsheet) to create reports and record and analyze data.
	07.02 Use schematic capture and simulation programs to create figures and gather data for technical reporting.
	07.03 Write reports and make oral presentations.
	07.04 Maintain a lab notebook documenting procedures, activities, observations, calculations, and results of conducted experiments.
08.0	Demonstrate proficiency in advanced direct current (DC) circuit network analysis–The student will be able to:
	08.01 Analyze multi source circuits using superposition theorem.
	08.02 Analyze circuits using Thevenin's theorem.
	08.03 Analyze circuits using Norton's theorem.
	08.04 Use branch current, nodal, source transformation and/or mesh current methods to analyze circuits.
	08.05 Analyze circuits using maximum power transfer theorem.
09.0	Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis--The student will be able to:

	09.01	Analyze magnetic circuits.
	09.02	Apply Faraday's law of induced voltages.
	09.03	Solve for mutual inductance in a coupled circuit.
	09.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze AC circuits.
	09.05	Identify the effects of transient spikes in RC, RL, and RLC circuits.
	09.06	Identify the effects of loading on transformers.
	09.07	Analyze multi source circuits using superposition theorem.
	09.08	Analyze circuits using Thevenin's theorem.
	09.09	Analyze circuits using Norton's theorem.
	09.10	Analyze circuits using maximum power transfer theorem.
	09.11	Analyze AC circuits using computer programs.
10.0	Demonstrate proficiency in design and analysis of discrete solid-state circuits–The student will be able to:	
	10.01	Construct, analyze, and troubleshoot regulator circuits using zener diodes.
	10.02	Construct, analyze, and troubleshoot bipolar junction transistor biased circuits.
	10.03	Construct, analyze, and troubleshoot field effect transistor biased circuits.
	10.04	Construct, analyze small signal amplifier circuits using bipolar junction or field effect transistors.
	10.05	Identify, define, construct, analyze, and troubleshoot multistage amplifiers.
	10.06	Identify, define, construct, analyze, and troubleshoot power amplifiers.
	10.07	Analyze low and high frequency amplifier responses.
	10.08	Discuss troubleshooting techniques applied to discrete solid state circuits.
	10.09	Discuss performance and applications for discrete solid state circuits.
	10.10	Analyze discrete solid-state circuits using computer programs.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Basic Electronics Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615030310
Program Type	College Credit Certificate (CCC)
Program Length	14 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to DC circuits, AC circuits, and digital circuits. Integrated into this content will be communications skills, leadership skills, human relations skills, employability skills, safe and efficient work practices, use of circuit diagrams and schematics, soldering, laboratory practices and technical recording and reporting.

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

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits.
03.0 Demonstrate proficiency in advanced direct current (DC) circuit network analysis.
04.0 Demonstrate proficiency in alternating current (AC) circuits.
05.0 Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis.
06.0 Demonstrate proficiency in digital circuits.
07.0 Demonstrate proficiency in technical recording and reporting.

Florida Department of Education
Student Performance Standards

Program Title: **Basic Electronics Technician**
CIP Number: **0615030310**
Program Length: **14 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply Occupational Safety Health Administration (OSHA) safety standards in an electronics laboratory environment.
01.02	Make electrical wire connections to create a functional circuit.
01.03	Identify and use electrical/electronic hand and power tools (wire stripper, wire needle-nose clipper, solder and desolder station, etc.).
01.04	Explain the theoretical concepts of soldering.
01.05	Identify non-functional solder connections.
01.06	Practice acceptable soldering, de-soldering, rework, and repair techniques.
01.07	Practice electrostatic discharge (ESD) safety procedures.
01.08	Describe the construction of printed circuit boards (PCBs).
01.09	Use circuit simulation programs to solve problems, verify circuit functionality and design circuits.
01.10	Demonstrate the use of instrumentation and module analytical software.
01.11	Read and interpret data sheet specifications for electronic components.
01.12	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
01.13	Use digital multi-meters (DMM), oscilloscopes, function generators, and power supplies to build, analyze and trouble shoot electrical/electronic circuits.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Describe the physical laws that govern electricity and magnetism.
02.02	Identify sources of electricity.
02.03	Define voltage, current, resistance, power and energy.
02.04	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.05	Read and interpret color codes and symbols to identify electrical components and values.

02.06	Measure properties of a circuit using Digital Multimeter (DMM) and oscilloscopes.
02.07	Calculate and measure the conductance and resistance of conductors and insulators.
02.08	Solve problems in electronics utilizing metric prefixes.
02.09	Apply Ohm's law and Kirchoff's voltage and current laws to solve series, parallel, and series-parallel circuits.
02.10	Construct and verify operation of series, parallel, and series-parallel circuits.
02.11	Analyze and troubleshoot series, parallel, and series-parallel circuits.
02.12	Apply Ohm's law and Kirchoff's voltage and current laws to bridge circuits.
02.13	Construct and verify the operation of bridge circuits.
02.14	Analyze and troubleshoot bridge circuits.
02.15	Identify and define voltage divider circuits (loaded and unloaded).
02.16	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.17	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.18	Apply maximum power transfer theory to determine the conditions under which maximum power transfer occurs in a circuit.
02.19	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.20	Describe magnetic properties of circuits and devices.
02.21	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
02.22	Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in advanced direct current (DC) circuit network analysis --The student will be able to:
03.01	Analyze multi source circuits using superposition theorem.
03.02	Analyze circuits using Thevenin's theorem.
03.03	Analyze circuits using Norton's theorem.
03.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze circuits.
03.05	Analyze circuits using maximum power transfer theorem.
04.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
04.01	Use trigonometry to solve AC circuits.
04.02	Identify properties of an AC signal.
04.03	Identify AC sources.
04.04	Analyze and measure AC signals utilizing DMM's, oscilloscope, frequency counter and function generator.
04.05	Define the characteristics of AC capacitive and inductive circuits.
04.06	Construct and verify the operation of AC capacitive and inductive circuits.

04.07	Analyze and troubleshoot AC capacitive and inductive circuits.
04.08	Define and apply the principles of transformers to AC circuits.
04.09	Construct and verify the operation of AC circuits utilizing transformers.
04.10	Analyze and troubleshoot AC circuits utilizing transformers.
04.11	Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constants.
04.12	Compute the impedance of passive RC, RL, and RLC circuits.
04.13	Analyze and troubleshoot passive differentiator and integrator circuits.
04.14	Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
04.15	Construct and verify the operation of RLC circuits (series, parallel and complex).
04.16	Define the characteristics of series and parallel resonant circuits.
04.17	Construct and verify the operation of series and parallel resonant circuits.
04.18	Analyze and troubleshoot R-C, R-L and RLC circuits.
04.19	Define the characteristics of frequency selective filter circuits.
04.20	Construct and verify the operation of frequency selective filter circuits.
04.21	Analyze and troubleshoot frequency selective filter circuits.
04.22	Define the characteristics of three-phase circuits.
04.23	Define basic motor theory and operation.
04.24	Define basic generator theory and operation.
04.25	Setup and operate power supplies for AC circuits.
04.26	Analyze and measure power in AC circuits.
04.27	Define power factor and power factor correction in AC circuits.
05.0	Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis--The student will be able to:
05.01	Analyze magnetic circuits.
05.02	Apply Faraday's law of induced voltages.
05.03	Solve for mutual inductance in a coupled circuit.
05.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze AC circuits.
05.05	Identify the effects of transient spikes in RC, RL, and RLC circuits.
05.06	Identify the effects of loading on transformers.
05.07	Analyze multi source circuits using superposition theorem.
05.08	Analyze circuits using Thevenin's theorem.

	05.09	Analyze circuits using Norton's theorem.
	05.10	Analyze circuits using maximum power transfer theorem.
	05.11	Analyze AC circuits using computer programs.
06.0	Demonstrate proficiency in digital circuits--The student will be able to:	
	06.01	Define and apply numbering systems to codes and arithmetic operations.
	06.02	Analyze and minimize logic circuits using Boolean and Karnaugh Map (K-Map) operations.
	06.03	Demonstrate proficiency in the use of logic probes for digital circuits.
	06.04	Describe the various logic families and their electrical characteristics, i.e., transistor-transistor logic (TTL), Complimentary Metal-Oxide Semiconductor (CMOS), etc.
	06.05	Use pulsers/pulse generators/clock signals to drive the inputs of digital circuits.
	06.06	Use oscilloscopes to analyze and troubleshoot digital circuits.
	06.07	Use logic analyzers to analyze and troubleshoot digital circuits.
	06.08	Determine the fan-out of digital circuits based on IC limitations.
	06.09	List the various types of logic gates and their truth tables.
	06.10	Construct combinational logic circuits using integrated circuits.
	06.11	Troubleshoot combinational and sequential logic circuits.
	06.12	Identify and analyze types of flip-flops and their truth tables.
	06.13	Construct flip-flops using integrated circuits.
	06.14	Troubleshoot flip-flop circuits.
	06.15	Identify types of registers and counters.
	06.16	Construct registers and counters using flip-flops and logic gates.
	06.17	Troubleshoot registers and counters.
	06.18	Analyze, construct, and troubleshoot clock and timing circuits.
	06.19	Identify, construct, and troubleshoot adder/subtractor logic circuits.
	06.20	Identify, construct, and troubleshoot encoders and decoders.
	06.21	Identify, construct, and troubleshoot multiplexer and demultiplexer circuits.
	06.22	Identify types of memory circuits.
	06.23	Describe and examine the uses of digital-to-analog and analog-to-digital conversions.
	06.24	Construct and troubleshoot digital-to-analog and analog-to-digital circuits.
	06.25	Identify, construct, and troubleshoot digital display circuits.
	06.26	Identify and apply Programmable Logic Device (PLD) concepts to logic devices.

07.0	Demonstrate proficiency in technical recording and reporting--The student will be able to:
	07.01 Use computer application programs (e.g. word processor, database, spreadsheet) to create reports and record and analyze data.
	07.02 Use schematic capture and simulation programs to create figures and gather data for technical reporting.
	07.03 Write reports and make oral presentations.
	07.04 Maintain a lab notebook documenting procedures, activities, observations, calculations, and results of conducted experiments.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Electronics Aide**
Specialization Tract: **Electronics**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615030313
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate proficiency in basic direct current (DC) circuits.
02.0 Demonstrate proficiency in AC circuits.
03.0 Demonstrate proficiency in solid state devices.
04.0 Demonstrate proficiency in digital circuits.

Florida Department of Education
Student Performance Standards

Program Title: **Electronics Aide**
CIP Number: **0615030313**
Program Length: **12 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in basic direct current (DC) circuits--The student will be able to:
01.01	Define the characteristics of basic DC circuits.
01.02	Solve problems in electronic units utilizing metric prefixes.
01.03	Identify sources of electricity.
01.04	Define and describe voltage, current, resistance, power and energy.
01.05	Apply Ohm's law and power formulas.
01.06	Read and interpret color codes and symbols to identify electrical components and values.
01.07	Measure properties of circuits using a digital multimeter meter (DMM) and oscilloscopes.
01.08	Set up and operate power supplies for DC circuits.
01.09	Compute conductance and measure resistance of conductors and insulators.
01.10	Apply Ohm's law to series circuits.
01.11	Construct and verify the operation of series circuits.
01.12	Analyze and troubleshoot series circuits.
01.13	Apply Ohm's law to parallel circuits.
01.14	Construct and verify the operation of parallel circuits.
01.15	Analyze and troubleshoot parallel circuits.
01.16	Measure values of resistors, capacitors and inductors.
01.17	Construct and verify the operation of capacitors and inductors.
01.18	Analyze and troubleshoot circuits containing capacitors and inductors.
01.19	Apply various network theorems to DC circuits.
02.0	Demonstrate proficiency in AC circuits--The student will be able to:

02.01	Solve basic trigonometric problems as applicable to AC circuits.
02.02	Define the characteristics of AC capacitive circuits.
02.03	Construct and verify the operation of AC capacitive circuits.
02.04	Analyze and troubleshoot AC capacitive circuits.
02.05	Define the characteristics of AC inductive circuits.
02.06	Construct and verify the operation of AC inductive circuits.
02.07	Analyze and troubleshoot AC inductive circuits.
02.08	Define and apply the principles of transformers to AC circuits.
02.09	Construct and verify the operation of AC circuits utilizing transformers.
02.10	Analyze and troubleshoot AC circuits utilizing transformers.
02.11	Construct and verify the operation of differentiators and integrators to determine R-C and R-L time constraints.
02.12	Analyze and troubleshoot differentiator and integrator circuits.
02.13	Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
02.14	Construct and verify the operation of series and parallel resonant circuits.
02.15	Define the characteristics of series and parallel resonant circuits.
02.16	Construct and verify the operation of series and parallel resonant circuits.
02.17	Analyze and troubleshoot R-C, R-L, and RLC circuits.
02.18	Define the characteristics of frequency selective filter circuits.
02.19	Construct and verify the operation of frequency selective filter circuits.
02.20	Analyze and troubleshoot frequency selective filter circuits.
02.21	Define the characteristics of polyphase circuits.
02.22	Define basic motor theory and operation.
02.23	Define basic generator theory and operation.
02.24	Set up and operate power supplies for AC circuits.
02.25	Analyze and measure power in AC circuits.
02.26	Set up and operate capacitor and inductor analyzers for AC circuits.
02.27	Apply various network theorems to AC circuits.
03.0	Demonstrate proficiency in solid state devices--The student will be able to:
03.01	Identify and define properties of semiconductor materials.
03.02	Identify and define operating characteristics and applications of junction diodes.

03.03	Identify and define operating characteristics and applications of special diodes.
03.04	Construct and verify the operation of diode circuits.
03.05	Analyze and troubleshoot diode circuits.
03.06	Identify and define operating characteristics and applications of bipolar transistors.
03.07	Identify and define operating characteristics and applications of field effect transistors.
03.08	Identify and define operating characteristics and applications of single-stage amplifiers.
03.09	Construct and verify the operation of single-stage amplifiers.
03.10	Analyze and troubleshoot single-stage amplifiers.
03.11	Construct and verify thyristor circuitry.
03.12	Analyze and troubleshoot thyristor circuitry.
03.13	Set up and operate DVM for solid-state devices.
03.14	Set up and operate power supplies for solid-state devices.
03.15	Set up and operate oscilloscopes for solid-state devices.
03.16	Set up and operate function generators for solid-state devices.
03.17	Set up and operate capacitor and inductor analyzers for solid-state devices.
03.18	Set up and operate curve tracers.
03.19	Set up and operate transistor testers.
03.20	Construct and analyze electronic circuits for all operating parameters.
03.21	Set up and operate measuring instruments for electronic circuit analysis.
03.22	Apply appropriate solid state circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.
04.0	Demonstrate proficiency in digital circuits--The student will be able to:
04.01	Define and apply numbering systems to codes and arithmetic operations.
04.02	Analyze and minimize logic circuits using Boolean operations.
04.03	Set up and operate logic probes for digital circuits.
04.04	Set up and operate power supplies for digital circuits.
04.05	Set up and operate pulsers for digital circuits.
04.06	Set up and operate oscilloscopes for digital circuits.
04.07	Set up and operate logic analyzers for digital circuits.
04.08	Set up and operate pulse generators for digital circuits.
04.09	Identify types of logic gates and their truth tables.

04.10	Construct combinational logic circuits using integrated circuits.
04.11	Troubleshoot logic circuits.
04.12	Analyze types of flip-flops and their truth tables.
04.13	Construct flip-flops using integrated circuits.
04.14	Troubleshoot flip-flops.
04.15	Identify, define and measure characteristics of integrated circuit (IC) logic families.
04.16	Identify types of registers and counters.
04.17	Construct registers and counters using flip-flops and logic gates.
04.18	Troubleshoot registers and counters.
04.19	Analyze clock and timing circuits.
04.20	Construct clock and timing circuits.
04.21	Troubleshoot clock and timing circuits.
04.22	Identify types of arithmetic-logic circuits.
04.23	Construct arithmetic-logic circuits.
04.24	Troubleshoot arithmetic-logic circuits.
04.25	Identify types of encoding and decoding devices.
04.26	Construct encoders and decoders.
04.27	Troubleshoot encoders and decoders.
04.28	Identify types of multiplexer and demultiplexer circuits.
04.29	Construct multiplexer and demultiplexer circuits using integrated circuits.
04.30	Troubleshoot multiplexer and demultiplexer circuits.
04.31	Identify types of memory circuits.
04.32	Identify types of digital displays.
04.33	Set up and operate measuring instruments for digital circuit analysis.
04.34	Apply appropriate digital circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic application.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Laser and Photonics Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615030411
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communications skills, leadership skills, human relations skills, employability skills, safe and efficient work practices, use of circuit diagrams and schematics, soldering, laboratory practices and technical recording and reporting.

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

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits
03.0 Demonstrate proficiency in alternating current (AC) circuits
04.0 Demonstrate proficiency in advanced direct current (DC) circuit network analysis
05.0 Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis

The following are intended outcomes for Laser and Photonics Technology for Electronic Engineering Technology programs that include a specialization in Laser and Photonics Technology as part of the program.

06.0 Demonstrate proficiency in photonics, optics and lasers.
07.0 Demonstrate proficiency in electro-optical devices.
08.0 Demonstrate proficiency in technical recording and reporting.

Florida Department of Education
Student Performance Standards

Program Title: **Laser and Photonics Technician**
CIP Number: **0615030411**
Program Length: **12 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply Occupational Safety Health Administration (OSHA) safety standards in an electronics laboratory environment.
01.02	Make electrical wire connections to create a functional circuit.
01.03	Identify and use electrical/electronic hand and power tools (wire stripper, wire needle-nose clipper, solder and desolder station, etc.).
01.04	Explain the theoretical concepts of soldering.
01.05	Identify non-functional solder connections.
01.06	Practice acceptable soldering, de-soldering, rework, and repair techniques.
01.07	Practice electrostatic discharge (ESD) safety procedures.
01.08	Describe the construction of printed circuit boards (PCBs).
01.09	Use circuit simulation programs to solve problems, verify circuit functionality and design circuits.
01.10	Demonstrate the use of instrumentation and module analytical software.
01.11	Read and interpret data sheet specifications for electronic components.
01.12	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
01.13	Use digital multi-meters (DMM), oscilloscopes, function generators, and power supplies to build, analyze and trouble shoot electrical/electronic circuits.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Describe the physical laws that govern electricity and magnetism.
02.02	Identify sources of electricity.
02.03	Define voltage, current, resistance, power and energy.
02.04	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.05	Read and interpret color codes and symbols to identify electrical components and values.

02.06	Measure properties of a circuit using Digital Multimeter (DMM) and oscilloscopes.
02.07	Calculate and measure the conductance and resistance of conductors and insulators.
02.08	Solve problems in electronics utilizing metric prefixes.
02.09	Apply Ohm's law and Kirchoff's voltage and current laws to solve series, parallel, and series-parallel circuits.
02.10	Construct and verify operation of series, parallel, and series-parallel circuits.
02.11	Analyze and troubleshoot series, parallel, and series-parallel circuits.
02.12	Apply Ohm's law and Kirchoff's voltage and current laws to bridge circuits.
02.13	Construct and verify the operation of bridge circuits.
02.14	Analyze and troubleshoot bridge circuits.
02.15	Identify and define voltage divider circuits (loaded and unloaded).
02.16	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.17	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.18	Apply maximum power transfer theory to determine the conditions under which maximum power transfer occurs in a circuit.
02.19	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.20	Describe magnetic properties of circuits and devices.
02.21	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
02.22	Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
03.01	Use trigonometry to solve AC circuits.
03.02	Identify properties of an AC signal.
03.03	Identify AC sources.
03.04	Analyze and measure AC signals utilizing DMM's, oscilloscope, frequency counter and function generator.
03.05	Define the characteristics of AC capacitive and inductive circuits.
03.06	Construct and verify the operation of AC capacitive and inductive circuits.
03.07	Analyze and troubleshoot AC capacitive and inductive circuits.
03.08	Define and apply the principles of transformers to AC circuits.
03.09	Construct and verify the operation of AC circuits utilizing transformers.
03.10	Analyze and troubleshoot AC circuits utilizing transformers.
03.11	Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constants.
03.12	Compute the impedance of passive RC, RL, and RLC circuits.

	03.13 Analyze and troubleshoot passive differentiator and integrator circuits.
	03.14 Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
	03.15 Construct and verify the operation of RLC circuits (series, parallel and complex).
	03.16 Define the characteristics of series and parallel resonant circuits.
	03.17 Construct and verify the operation of series and parallel resonant circuits.
	03.18 Analyze and troubleshoot R-C, R-L and RLC circuits.
	03.19 Define the characteristics of frequency selective filter circuits.
	03.20 Construct and verify the operation of frequency selective filter circuits.
	03.21 Analyze and troubleshoot frequency selective filter circuits.
	03.22 Define the characteristics of three-phase circuits.
	03.23 Define basic motor theory and operation.
	03.24 Define basic generator theory and operation.
	03.25 Setup and operate power supplies for AC circuits.
	03.26 Analyze and measure power in AC circuits.
	03.27 Define power factor and power factor correction in AC circuits.
04.0	Demonstrate proficiency in advanced direct current (DC) circuit network analysis --The student will be able to:
	04.01 Analyze multi source circuits using superposition theorem.
	04.02 Analyze circuits using Thevenin's theorem.
	04.03 Analyze circuits using Norton's theorem.
	04.04 Use branch current, nodal, source transformation and/or mesh current methods to analyze circuits.
	04.05 Analyze circuits using maximum power transfer theorem.
05.0	Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis--The student will be able to:
	05.01 Analyze magnetic circuits.
	05.02 Apply Faraday's law of induced voltages.
	05.03 Solve for mutual inductance in a coupled circuit.
	05.04 Use branch current, nodal, source transformation and/or mesh current methods to analyze AC circuits.
	05.05 Identify the effects of transient spikes in RC, RL, and RLC circuits.
	05.06 Identify the effects of loading on transformers.
	05.07 Analyze multi source circuits using superposition theorem.
	05.08 Analyze circuits using Thevenin's theorem.

	05.09 Analyze circuits using Norton's theorem.
	05.10 Analyze circuits using maximum power transfer theorem.
	05.11 Analyze AC circuits using computer programs.
The following are student performance standards for Laser and Photonics Technology for Electronic Engineering Technology programs that include a specialization in Laser and Photonics Technology as part of the program.	
06.0	Demonstrate proficiency in photonics, optics and lasers --The student will be able to:
	06.01 Describe the nature and properties of light.
	06.02 Demonstrate the proper handling of optical components and positioning equipment.
	06.03 Describe the different light sources used in the photonics industry.
	06.04 Demonstrate understanding of laser safety.
	06.05 Setup and operate basic optical systems.
	06.06 Demonstrate understanding of geometrical and physical optics.
	06.07 Demonstrate understanding of the principles of lasers.
	06.08 List and describe the operational characteristics of lasers.
	06.09 Categorize and explain the operation of lasers.
	06.10 Explain the construction, operation, and applications of optical detectors.
	06.11 Explain the principles of human vision and related laser safety issues.
	06.12 List and explain the characteristics of photonic devises used for imaging, display and storage.
	06.13 Explain the principles of fiber optic communications.
07.0	Demonstrate proficiency in electro-optical devices--The student will be able to:
	07.01 Demonstrate proficiency in fundamentals of light.
	07.02 Demonstrate proficiency in reflection, refraction, and mirrors.
	07.03 Demonstrate proficiency in measurement of maximum power and pulse energy.
	07.04 Define radiation sources, their types, properties, and applications.
	07.05 Demonstrate proficiency in measurement of detector rise time.
	07.06 Demonstrate proficiency in prisms, optical filters, resonator, and beam splitters.
	07.07 Demonstrate proficiency in characteristics of a helium-neon laser.
	07.08 Demonstrate proficiency in the use of photo detectors, and LEDs.
	07.09 Demonstrate proficiency in bandwidth in optical power measurements.
	07.10 Demonstrate proficiency in different applications of solid-state lasers.

	07.11	Demonstrate proficiency in explaining and describing different types of gases used as active media or lasers.
	07.12	Demonstrate proficiency in calculating the power, irradiance and area of a laser beam.
	07.13	Demonstrate proficiency in energy-transfer processes that increase the lower lasing level in gas lasers and solid-state lasers.
	07.14	Explain the processes that account for all the light energy striking a surface.
	07.15	Demonstrate proficiency in safety precautions when operating a laser.
	07.16	Demonstrate proficiency in four elements of a laser.
08.0	Demonstrate proficiency in technical recording and reporting--The student will be able to:	
	08.01	Use computer application programs (e.g. word processor, database, spreadsheet) to create reports and record and analyze data.
	08.02	Use schematic capture and simulation programs to create figures and gather data for technical reporting.
	08.03	Write reports and make oral presentations.
	08.04	Maintain a lab notebook documenting procedures, activities, observations, calculations, and results of conducted experiments.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Wireless and IP Communications Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615030505
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	Phi Beta Lambda, BPA (Business Professionals of America)
SOC Codes (all applicable)	15-1143 – Computer Network Architect
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

This program prepares individuals to design, install, configure, and troubleshoot wireless and IP Telephony networks. Graduates of this technical program will be prepared to enter advanced training and education in specialized IP Communications related fields.

The content includes but is not limited to RF Fundamentals, use of circuit diagrams and schematics, soldering, Wireless Site Surveying, Wireless Security, Design of Converged and Integrated Services Networks, Fundamentals of Voice over IP, Voice Gateway Protocols, and Introduction to Routing and Switching.

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

Standards

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

01.0 Demonstrate proficiency in computer systems architecture.
02.0 Demonstrate proficiency in communication interfacing.
03.0 Demonstrate proficiency in customer relations.
04.0 Demonstrate proficiency in computer networking techniques.
05.0 Demonstrate proficiency in analysis and design of data communications systems.
06.0 Demonstrate appropriate communication skills.
07.0 Demonstrate employability skills.
08.0 Demonstrate proficiency in RF Math Calculations.
09.0 Demonstrate proficiency in planning and deploying Wireless LANs.
10.0 Demonstrate proficiency in Conducting Site Surveying
11.0 Demonstrate proficiency in implementing Wireless LAN security.
12.0 Demonstrate proficiency in configuring IP Telephony servers.
13.0 Demonstrate proficiency in interconnecting network devices.
14.0 Demonstrate proficiency in configuring and troubleshooting Voice Gateways.
15.0 Demonstrate proficiency in configuring Quality of Service for Integrated Services Networks

Florida Department of Education
Student Performance Standards

Program Title: **Wireless and IP Communications Technician**
CIP Number: **0615030505**
Program Length: **15 credit hours**
SOC Code(s): **15-1143**

This certificate program is part of the Computer Engineering Technology AS/AAS degree program (1615120100/0615120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in computer systems architecture--The student will be able to:
01.01	Draw and explain systems configurations in block detail.
01.02	Interpret computer acronyms.
01.03	Identify and define priorities and interrupts at system level.
01.04	Define and list direct memory access handling systems.
01.05	Define functions of advanced memory techniques (e.g. virtual, pipeline, cache).
01.06	Troubleshoot a microcomputer system.
02.0	Demonstrate proficiency in communication interfacing--The student will be able to:
02.01	Identify and define serial and parallel interface standards.
02.02	Identify, define and configure sync and async devices.
02.03	Demonstrate the use of interface devices.
02.04	Identify and define networking levels.
02.05	Identify and define protocols.
02.06	Troubleshoot and repair network systems.
02.07	Identify and define multi-user systems.
03.0	Demonstrate proficiency in customer relations--The student will be able to:
03.01	Describe effective listening techniques.
03.02	Describe techniques for instilling customer confidence.
03.03	Describe techniques for keeping the customer informed.
03.04	Demonstrate proper follow-up techniques.
04.0	Demonstrate proficiency in computer networking techniques--The student will be able to:

	04.01 Identify and define computer networking techniques.
	04.02 Design a system using hardware and software communication protocols.
	04.03 Apply management techniques for network software.
05.0	Demonstrate proficiency in analysis and design of data communications systems--The student will be able to:
	05.01 Describe the different types of digital data communications systems.
	05.02 Describe data formats and transmission rates in serial data communications systems.
	05.03 Design the connections and programming for a UART (Universal Asynchronous/Synchronous Receiver Transmitter) in a microprocessor-based system.
	05.04 Identify and define available options for integration of a display terminal in a data communication system.
	05.05 Identify and define communication signals and protocol for MODEM (Modulator Demodulator) links.
	05.06 Apply digital modulation techniques including PAM (Pulse-Amplitude Modulation), PCM (Pulse-Code Modulation), PWM (Pulse-Width
	05.07 Analyze and design circuits for generation and detection of digital modulation.
	05.08 Apply error detection and correction in digital communication systems.
	05.09 Define communication protocols.
	05.10 Design and apply multiplexing techniques for computer.
06.0	Demonstrate appropriate communication skills—The student will be able to:
	06.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	06.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	06.03 Read and follow written and oral instructions.
	06.04 Answer and ask questions coherently and concisely.
	06.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	06.06 Demonstrate appropriate telephone/communication skills.
07.0	Demonstrate proficiency in RF math calculations-- The student will be able to:
	07.01 Convert between milliwatts and dBm.
	07.02 Use power calculations to calculate change in power.
	07.03 Explain the concepts of polarization, gain, beam width and free-space path loss.
	07.04 Identify the basic attributes, purposes, and functions of antenna types.
	07.05 Identify and apply the concepts that make up the functionality of spread spectrum technology.
	07.06 Recognize concepts associated with wireless LAN service sets.
	07.07 Calculate the Fresnel Zone radius.

	07.08	Investigate the relationship between range and signal strength.
08.0	Demonstrate proficiency in planning and deploying wireless LANs--The student will be able to:	
	08.01	Set up a wireless client.
	08.02	Understand the concept of an SSID.
	08.03	Understand the nature of an ad hoc wireless network.
	08.04	Use Windows XP to manage a wireless connection.
	08.05	Explain the purpose of the HyperTerminal program.
	08.06	Identify the equipment necessary to connect locally to an access point for configuration via HyperTerminal.
	08.07	Describe the basic commands used to display the access point's configuration and interface information, and to configure an IP address.
	08.08	Identify the purpose of infrastructure devices and how to install, configure, and manage them.
	08.09	Identify the purpose of LAN client devices and how to install, configure and manage them.
	08.10	Identify, understand, correct, or compensate for wireless LAN implementation challenges.
	08.11	Explain the trade-off between range and throughput.
	08.12	Analyze direct sequence spread spectrum behavior in a co-located channel environment.
	08.13	Examine co-channel interference using different access points.
09.0	Demonstrate proficiency in conducting site surveying -- The student will be able to:	
	09.01	Identify and understand the importance and process of conducting a thorough site survey.
	09.02	Identify and understand the importance of the necessary tasks to do an RF site survey.
	09.03	Identify the necessary equipment needed to perform a site survey.
	09.04	Assess the performance of an ad hoc wireless network by calculating throughput.
	09.05	Assess the performance of an infrastructure wireless network by calculating throughput.
	09.06	Identify and discuss the design elements for creating an extended service set.
	09.07	Differentiate between layer-two and layer-three roaming.
	09.08	Discuss the configuration of mobile IP as it pertains to wireless communication.
	09.09	Conduct a feasibility-study/return-on-investment study for deploying wireless solutions in a production environment.
	09.10	Baseline the performance of the wireless network and plan for future growth.
10.0	Demonstrate proficiency in implementing wireless LAN security - The student will be able to:	
	10.01	Identify the strengths, weaknesses, and appropriate uses of wireless LAN security techniques.
	10.02	Describe the types of wireless attacks, and explain how to identify and prevent them.
	10.03	Create and apply a MAC filter.

10.04	Configure open authentication with Wired-Equivalent Privacy.
10.05	Configure Service Set Identification in more secured manner.
10.06	Analyze the impact of spoofed MAC addresses on the security of a wireless network.
10.07	Create and apply IP filters.
10.08	Configure the Temporal Key Integrity Protocol.
10.09	Describe the problem of rouge access points and identify techniques of locating rouge access points.
10.10	Demonstrate proficiency in using wireless protocols analyzer.
10.11	Implement and configure WiFi Protected Access (WPA) and WPA version 2.
10.12	Configure Secure Shell sessions as a way to remotely manage access points and wireless bridges.
10.13	Implement and configure 802.1x authentication standards.
10.14	Implement and configure wireless encryption.
11.0	Demonstrate proficiency in configuring IP telephony servers -- The student will be able to:
11.01	Differentiate between packet-switched voice networks and circuit-switched voice networks.
11.02	Explain the role of Ethernet telephony servers in call admission.
11.03	Install and configure telephony servers such as Cisco call manager, and Linux Trixbox.
11.04	Configure IP phones to successfully register with telephony servers.
11.05	Explain the call routing login used by telephony servers.
11.06	Configure individualized routing using Partitions and call search spaces.
11.07	Configure the basic functions of IP phones such as: call park, call forwarding, and call pickup.
11.08	Configure telephony servers with basic functions such as: call conferencing, meet-me extensions, and digital receptionist.
11.09	Explain and differentiate among the following compression algorithms: G.711, G.729, G.226, and iLBC.
11.10	Configure Device pools, Regions and Locations.
11.11	Troubleshoot IP Telephony servers by analyzing log files.
11.12	Troubleshoot the performance of an IP telephony network by analyzing the output of a protocol analyzer.
11.13	Install, configure, and register soft phones such as Cisco IP Communicator, and X-lite to register with IP telephony servers.
12.0	Demonstrate proficiency in interconnecting network devices--The student will be able to:
12.01	Identify the equipment needed in building packet-switched voice networks.
12.02	Explain the role of each of the devices needed to build a packet-switched voice network.
12.03	Configure Ethernet switches with voice VLANs.
12.04	Configure switches with power-over Ethernet.

	12.05 Configure wireless access points with voice VLANs.
	12.06 Identify the different types of cables needed to interconnect networking devices.
	12.07 Explain the difference between collision domains and broadcast domains.
	12.08 Configure VLAN trunking.
	12.09 Analyze a switch's MAC address table.
	12.10 Analyze a router's routing table
	12.11 Analyze an access point's association table.
	12.12 Troubleshoot the connection between networking devices using network management applications such as Kiwi Syslog.
13.0	Demonstrate proficiency in configuring and troubleshooting voice gateways--The student will be able to:
	13.01 Explain the role of voice gateways in packet-switched voice networks.
	13.02 Explain the process of registering voice gateways with an IP telephony server.
	13.03 Install and configure an H.323 voice gateway.
	13.04 Install and configure a SIP voice gateway.
	13.05 Install and configure an MGCP voice gateway.
	13.06 Recognize different voice network modules and voice interfaces in voice gateways.
	13.07 Configure a voice gateway with VoIP and POTS dial peers.
	13.08 Configure a voice gateway with routing protocols such as RIP and EIGRP.
	13.09 Troubleshoot the performance of a voice gateway by utilizing debug and show commands.
	13.10 Explain the role of voice gateways in connecting packet-switched voice networks to circuit-switched voice networks.
14.0	Demonstrate proficiency in configuring quality of service for integrated services networks--The student will be able to:
	14.01 Explain latency, packet loss, and jitter.
	14.02 Identify sources of delay.
	14.03 Identify techniques for implementing quality of service over low speed links.
	14.04 Configure Differentiated services to support a VoIP call.
	14.05 Configure Ethernet switches with class of service
	14.06 Explain the classification, tagging and queuing of IP packets.
	14.07 Implement and configure Cisco Auto quality of service.
	14.08 Identify and troubleshoot quality-of-service related problems in a packet-switched voice network.
15.0	Demonstrate employability skills--The student will be able to:
	15.01 Conduct a job search.

15.02	Secure information about a job.
15.03	Identify documents that may be required when applying for a job.
15.04	Complete a job application form correctly.
15.05	Demonstrate competence in job interview techniques.
15.06	Demonstrate knowledge of how to make appropriate decisions.
15.07	Demonstrate appropriate work/behavioral habits.
15.08	Demonstrate acceptable employee personal hygiene and health.
15.09	Demonstrate knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes Chapter 442.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

Phi Beta Lambda and BPA are the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Robotics and Simulation Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615040514
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to the basic electronics competencies as identified by the electronics industry, which is prerequisite for all technical programs. This program is designed to prepare individuals in the areas of Robotic Applications, Modeling and Simulation, and Virtual Reality Environment. Upon completion of this technical program, the student will be able to install, maintain and troubleshoot general robot systems and simulators. Graduates of this technical program will be prepared to enter advanced training and education in specialized Robotics and Simulation related fields.

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

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits.
03.0 Demonstrate proficiency in alternating current (AC) circuits.
04.0 Demonstrate proficiency in technical recording and reporting.
05.0 Demonstrate proficiency in advanced direct current (DC) circuit network analysis.
06.0 Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis.

The following are intended outcomes for Robotics and Simulation Technology for Electronics Engineering Technology programs that include a specialization in Robotics and Simulation Technology as part of the program.

07.0 Demonstrate proficiency in robotics and automation.
08.0 Demonstrate proficiency in modeling and simulation.

Florida Department of Education
Student Performance Standards

Program Title: **Robotics and Simulation Technology**
CIP Number: **0615040514**
Program Length: **12 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply Occupational Safety Health Administration (OSHA) safety standards in an electronics laboratory environment.
01.02	Make electrical wire connections to create a functional circuit.
01.03	Identify and use electrical/electronic hand and power tools (wire stripper, wire needle-nose clipper, solder and desolder station, etc.).
01.04	Explain the theoretical concepts of soldering.
01.05	Identify non-functional solder connections.
01.06	Practice acceptable soldering, de-soldering, rework, and repair techniques.
01.07	Practice electrostatic discharge (ESD) safety procedures.
01.08	Describe the construction of printed circuit boards (PCBs).
01.09	Use circuit simulation programs to solve problems, verify circuit functionality and design circuits.
01.10	Demonstrate the use of instrumentation and module analytical software.
01.11	Read and interpret data sheet specifications for electronic components.
01.12	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
01.13	Use digital multi-meters (DMM), oscilloscopes, function generators, and power supplies to build, analyze and trouble shoot electrical/electronic circuits.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Describe the physical laws that govern electricity and magnetism.
02.02	Identify sources of electricity.
02.03	Define voltage, current, resistance, power and energy.
02.04	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.05	Read and interpret color codes and symbols to identify electrical components and values.

02.06	Measure properties of a circuit using Digital Multimeter (DMM) and oscilloscopes.
02.07	Calculate and measure the conductance and resistance of conductors and insulators.
02.08	Solve problems in electronics utilizing metric prefixes.
02.09	Apply Ohm's law and Kirchoff's voltage and current laws to solve series, parallel, and series-parallel circuits.
02.10	Construct and verify operation of series, parallel, and series-parallel circuits.
02.11	Analyze and troubleshoot series, parallel, and series-parallel circuits.
02.12	Apply Ohm's law and Kirchoff's voltage and current laws to bridge circuits.
02.13	Construct and verify the operation of bridge circuits.
02.14	Analyze and troubleshoot bridge circuits.
02.15	Identify and define voltage divider circuits (loaded and unloaded).
02.16	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.17	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.18	Apply maximum power transfer theory to determine the conditions under which maximum power transfer occurs in a circuit.
02.19	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.20	Describe magnetic properties of circuits and devices.
02.21	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
02.22	Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
03.01	Use trigonometry to solve AC circuits.
03.02	Identify properties of an AC signal.
03.03	Identify AC sources.
03.04	Analyze and measure AC signals utilizing DMM's, oscilloscope, frequency counter and function generator.
03.05	Define the characteristics of AC capacitive and inductive circuits.
03.06	Construct and verify the operation of AC capacitive and inductive circuits.
03.07	Analyze and troubleshoot AC capacitive and inductive circuits.
03.08	Define and apply the principles of transformers to AC circuits.
03.09	Construct and verify the operation of AC circuits utilizing transformers.
03.10	Analyze and troubleshoot AC circuits utilizing transformers.
03.11	Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constants.
03.12	Compute the impedance of passive RC, RL, and RLC circuits.

	03.13 Analyze and troubleshoot passive differentiator and integrator circuits.
	03.14 Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
	03.15 Construct and verify the operation of RLC circuits (series, parallel and complex).
	03.16 Define the characteristics of series and parallel resonant circuits.
	03.17 Construct and verify the operation of series and parallel resonant circuits.
	03.18 Analyze and troubleshoot R-C, R-L and RLC circuits.
	03.19 Define the characteristics of frequency selective filter circuits.
	03.20 Construct and verify the operation of frequency selective filter circuits.
	03.21 Analyze and troubleshoot frequency selective filter circuits.
	03.22 Define the characteristics of three-phase circuits.
	03.23 Define basic motor theory and operation.
	03.24 Define basic generator theory and operation.
	03.25 Setup and operate power supplies for AC circuits.
	03.26 Analyze and measure power in AC circuits.
	03.27 Define power factor and power factor correction in AC circuits.
04.0	Demonstrate proficiency in technical recording and reporting--The student will be able to:
	04.01 Use computer application programs (e.g. word processor, database, spreadsheet) to create reports and record and analyze data.
	04.02 Use schematic capture and simulation programs to create figures and gather data for technical reporting.
	04.03 Write reports and make oral presentations.
	04.04 Maintain a lab notebook documenting procedures, activities, observations, calculations, and results of conducted experiments.
05.0	Demonstrate proficiency in advanced direct current (DC) circuit network analysis --The student will be able to:
	05.01 Analyze multi source circuits using superposition theorem.
	05.02 Analyze circuits using Thevenin's theorem.
	05.03 Analyze circuits using Norton's theorem.
	05.04 Use branch current, nodal, source transformation and/or mesh current methods to analyze circuits.
	05.05 Analyze circuits using maximum power transfer theorem.
06.0	Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis--The student will be able to:
	06.01 Analyze magnetic circuits.
	06.02 Apply Faraday's law of induced voltages.
	06.03 Solve for mutual inductance in a coupled circuit.

06.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze AC circuits.
06.05	Identify the effects of transient spikes in RC, RL, and RLC circuits.
06.06	Identify the effects of loading on transformers.
06.07	Analyze multi source circuits using superposition theorem.
06.08	Analyze circuits using Thevenin's theorem.
06.09	Analyze circuits using Norton's theorem.
06.10	Analyze circuits using maximum power transfer theorem.
06.11	Analyze AC circuits using computer programs.
The following are intended outcomes for Robotics and Simulation Technology for Electronics Engineering Technology programs that include a specialization in Robotics and Simulation Technology as part of the program.	
07.0	Demonstrate proficiency in analysis of a basic robotics and simulation systems--The student will be able to:
07.01	Describe the major parts of a robotic system.
07.02	Explain and use sensors used in robotics applications.
07.03	Describe the operation of DC motors, gearing, and electronic control.
07.04	Describe proportional and derivative feedback control systems.
07.05	Construct robot platforms.
07.06	Explain serial communications and data collection.
07.07	Write control programs for robots.
07.08	Download programs to robots and test them.
07.09	Describe shaft encoding and infrared sensing.
07.10	Explain ultrasonic distance sensing.
07.11	Describe the architecture and provide a system overview for the hardware and software found in a typical automated work cell.
07.12	Analyze and interpret typical PLC ladder logic programs.
08.0	Demonstrate proficiency in modeling and simulation--The student will be able to:
08.01	Define Interactive Simulation/Intelligent Systems/Automated Equipment, Robotics, Artificial Intelligence.
08.02	Demonstrate an understanding of Modeling and Simulation Paradigms and Concepts/Types, Randomness, Time, Application, Domain.
08.03	Demonstrate an understanding of Modeling Methods/Definition, Non-Executable Models, Executable Models, and other Model Types.
08.04	Explain Architecture and Conceptual Modeling/What does a Modeling and Simulation System do? Explain Interoperability Techniques, Live, Virtual and Constructive, Phases of Modeling.

08.05	Define Hardware - Outputs/Glasses (Filter glasses, Shutter glasses)/Sound and Audio (Human Auditory System, 3D Sound, Head-based unit)/Haptic Feedback/Visual Displays/Vestibular and Other Senses
08.06	Define Modeling, Mathematics and Physics/Geometry Modeling/Kinematics Modeling/Physical Modeling/Model Management.
08.07	Define 3D and Graphics/Computer Graphic/Dynamic Objects/Perspective Views/3D Clipping/Stereoscopic Vision/Rendering Image, Algorithms/Mapping (Texture, Bumps) Shadows, Reflection, Refraction.
08.08	Demonstrate an understanding of Applications/Creating an Application (From other Media, from an existing VR System)/Industrial (Manufacturing, Robotics)/Training Simulators/Education/Arts/Entertainment and Games/Medical/Military.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Automation**
Specialization Tract: **Advanced Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615040601
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours (Primary), 15 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3027 – Mechanical Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to instruction in maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Operate industrial automation systems.
02.0 Troubleshoot industrial automation systems.
03.0 Apply the principles of robotics to automated systems.
04.0 Use proficiently human machine interfaces to operate automated systems.

Florida Department of Education
Student Performance Standards

Program Title: **Automation**
CIP Number: **0615040601**
Program Length: **12 credit hours**
SOC Code(s): **17-3027**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Operate industrial automation systems--The student will be able to:
01.01	Read and understand schematic diagrams.
01.02	Chart and analyze ladder logic diagrams for industrial automation systems.
01.03	Identify Programmable Logic Controller input and output module locations.
01.04	Match wiring harness identification to program addresses for input and output modules.
01.05	Identify active and passive states of each module.
01.06	Interpret flow charts to match field device components with the real devices.
01.07	Identify when a programmable controller is in run or program mode, or is in a fault condition.
01.08	Integrate control systems and equipment with production and production support mechanisms.
01.09	Establish routine operations involving maintenance schedules.
01.10	Troubleshoot problems and perform minor repairs to industrial automation systems.
01.11	Integrate control systems and equipment with production and production support mechanisms.
01.12	Demonstrate automatic inventory accounting related monitoring and control systems.
01.13	Implement automatic tracking of materials and products using bar codes, machine vision and sensing, and/or infrared technologies.
02.0	Troubleshoot industrial automation systems--The student will be able to:
02.01	Demonstrate troubleshooting techniques to identify root cause, errors and faults of a problem.
02.02	Isolate systems for troubleshooting.
02.03	Develop a strategy for making system improvements based on troubleshooting activities with strong focus on fail-safing.
02.04	Identify needed expertise to address the issue.
02.05	Participate in troubleshooting and resolution teams effectively.
03.0	Apply the principles of robotics to automated systems--The student will be able to:

	03.01 Define the essential components of a robotic system.
	03.02 Choose appropriate robotic equipment for specific tasks.
	03.03 Describe methods of moving robotic parts.
	03.04 Choose and implement appropriate sensors for robotic applications.
	03.05 Choose and install appropriate actuators for robotic applications.
	03.06 Program robotic devices for restricted movements.
04.0	Use proficiently human machine interfaces to operate automated systems--The student will be able to:
	04.01 Match computer graphic icons to real field equipment
	04.02 Route data flow between computer and controlled machines.
	04.03 Identify computer input and output signals and equipment destinations.
	04.04 Implement manual override appropriately.
	04.05 Perform computer based system and/or machine troubleshooting.
	04.06 Define the essential components of an integrated HMI system.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Computer Automation Technology**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615040604
Program Type	College Credit Certificate (CCC)
Program Length	33 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Integrated Manufacturing Technology AS degree program (1615061306).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to programming, interfacing, calibration of production line equipment, integration of controllers with work cells, robotics, vision systems, retrieval systems, production planning operating and maintaining production equipment and test instruments, CIM systems analysis, data communications, and quality assurance.

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

Standards

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

01.0 Demonstrate proficiency in machines and mechanisms.
02.0 Demonstrate proficiency in manufacturing processes.
03.0 Demonstrate proficiency in operating and maintaining manufacturing equipment for automated assembly.
04.0 Demonstrate proficiency in evaluating the efficiency and performance of individual production line equipment.
05.0 Demonstrate proficiency in integrating production equipment with work cells, programmable logic controllers and area controllers.
06.0 Demonstrate proficiency in bar coding, automatic tracking vision systems and automatic storage and retrieval systems for materials handling.
07.0 Demonstrate proficiency in manufacturing software applications used for production planning, quality control and shop floor data collection.
08.0 Demonstrate proficiency in programming and controlling production machines in a flexible automation environment.
09.0 Demonstrate proficiency in operating and maintaining production test equipment and instruments.
10.0 Demonstrate proficiency in CIM systems analysis.
11.0 Demonstrate proficiency in installing, maintaining and understanding network and data communications devices.
12.0 Demonstrate proficiency in use of quality assurance methods and statistical process control techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Automation Technology**
CIP Number: **0615040604**
Program Length: **33 credit hours**
SOC Code(s): **17-3023**

This certificate program is part of the Computer Integrated Manufacturing Technology AS degree program (1615061306). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in machines and mechanisms--The student will be able to:
01.01	Identify, define and analyze various electromechanical systems, including pneumatic, hydraulic and electrical.
01.02	Construct flow diagrams of electromechanical system.
01.03	Analyze and identify mechanical linkages (gears, pulleys, limit switches, etc.).
01.04	Analyze and identify electromechanical devices (motors, servos, relays, stepping switches, timing devices, etc.).
01.05	Analyze and identify sensing elements.
01.06	Analyze and identify optical scanning and encoding/decoding devices.
01.07	Analyze and identify error sensing/feedback and control mechanisms.
02.0	Demonstrate proficiency in manufacturing processes--The student will be able to:
02.01	Understand current manufacturing processes.
02.02	Understand the use of current manufacturing machines, operating systems and mechanisms.
02.03	Understand hydraulic, electrical and pneumatic devices used in production assembly and materials handling.
02.04	Understand OSHA, state, and local safety requirements for the manufacturing and assembly operations with automated equipment.
02.05	Understand manpower needs and skills needed in assembly operations.
02.06	Understand integration requirements for charging conventional manufacturing to CIM.
02.07	Understand the criteria for tool design, maintenance, procurement and handling.
02.08	Understand gage design, usage and limitations.
02.09	Understand the requirements and solutions for raw materials orientation and clamping.
02.10	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for robotics.
02.11	Understand the functions of the industrial computer and microprocessor controls in modern manufacturing.
03.0	Demonstrate proficiency in operating and maintaining manufacturing equipment for automated assembly--The student will be able to:

	03.01 Interpret blueprints, schematics and technical manuals.
	03.02 Establish routine operations involving maintenance schedules.
	03.03 Analyze system failures.
	03.04 Perform minor repairs to CIM systems.
	03.05 Coordinate and specify maintenance service.
	03.06 Evaluate need for equipment replacement, overhaul and retooling.
04.0	Demonstrate proficiency in evaluating the efficiency and performance of individual production line equipment--The student will be able to:
	04.01 Analyze and utilize statistical data from process control systems.
	04.02 Describe the relationship of equipment utilization to the manufacturing economy.
	04.03 Prepare and evaluate justifications for specification deviations.
05.0	Demonstrate proficiency in integrating production equipment with workcells, programmable logic controllers and area controllers--The student will be able to:
	05.01 Design analog and digital control systems along with applicable software to specific manufacturing requirements.
	05.02 Chart and analyze ladder logic diagrams for manufacturing processes.
	05.03 Develop and analyze flow charts from ladder diagrams and related process controls.
	05.04 Operate programmable logic controllers with device drivers.
	05.05 Apply software to work cells and area controllers.
	05.06 Integrate control systems and equipment with production and production support mechanisms.
06.0	Demonstrate proficiency in bar coding, automatic tracking vision systems and automatic storage and retrieval systems for materials handling--The student will be able to:
	06.01 Describe machine vision applications.
	06.02 Maintain machine vision and sensing system equipment.
07.0	Demonstrate proficiency in manufacturing software applications used for production planning, quality control and shop floor data collection--The student will be able to:
	07.01 Apply proficiency in manufacturing software application packages.
	07.02 Analyze data collection systems for maintaining the progress of each order.
	07.03 Assign and maintain priorities of individual orders.
08.0	Demonstrate proficiency in programming and controlling production machines in a flexible automation environment--The student will be able to:
	08.01 Define and analyze product manufacturing requirements and process.
	08.02 Identify the responsibilities of management in produced production.
	08.03 Integrate personnel, hardware and software capabilities for the timely completion of product manufacturing.

	08.04 Describe the relationship of quality assurance and manufacturing.
	08.05 Apply the basic principles underlying the relationship between systems design, production and manufacturing engineering.
	08.06 Apply manufacturing simulation packages used in layout and design of production operations.
	08.07 Apply manufacturing resources planning and just-in-time concepts in production planning operations.
	08.08 Apply engineering economy factors in equipment justification.
	08.09 Apply microprocessor controls to a modern manufacturing system.
09.0	Demonstrate proficiency in operating and maintaining production test equipment and instruments--The student will be able to:
	09.01 Specify, interconnect and operate instruments and test equipment.
	09.02 Analyze normal and abnormal instrument readings and their probable causes.
	09.03 Specify and operate Automatic Test Equipment (ATE) procedures, using required software and hardware.
	09.04 Troubleshoot control systems mechanisms and software.
	09.05 Repair faults in production equipment and specify external repairs or overhaul requirements.
	09.06 Align, calibrate and maintain related ATE interfaces and circuits.
10.0	Demonstrate proficiency in CIM systems analysis--The student will be able to:
	10.01 Describe the concepts of a generic CIM system.
	10.02 Analyze and identify problems with the operation of industrial computers, controllers and hardware.
	10.03 Utilize typical screens and files available to shop floor operations for troubleshooting and data collection.
	10.04 Operate industrial terminals, input/output communications interface devices, etc., found in the manufacturing environment.
11.0	Demonstrate proficiency in installing, maintaining and understanding network and data communications devices--The student will be able to:
	11.01 Identify and apply communications protocols.
	11.02 Identify and apply networks and classifications.
	11.03 Identify and apply throughput, memory size/capabilities and standards benchmark.
	11.04 Identify and apply computer options for sharing directories, files and servers.
	11.05 Select and apply sensors and feedback devices.
	11.06 Select and interconnect cabling, repeaters, modems and multiplexers.
12.0	Demonstrate proficiency in use of quality assurance methods and statistical process control techniques--The student will be able to:
	12.01 Describe the concept of quality assurance in increasing productivity and promoting zero defects.
	12.02 Apply data collection methods for productivity improvement and reporting.
	12.03 Analyze productivity data, identify problem areas and evaluate the cause and effect relationship.
	12.04 Develop and apply quality improvement strategies.
	12.05 Develop and apply QA methods and techniques for production and product handling in a CIM environment.

12.06 Understand process capability and its applications.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Alternative Energy Systems Specialist**
Specialization Tract: **Alternative Energy**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615050303
Program Type	College Credit Certificate (CCC)
Program Length	18 credit hours (Primary), 15 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electronics and Electronic Engineering Technicians 47-2231 – Solar Photovoltaic Installers 47-4099 – Construction and Related Workers, All Others
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The purpose of this CCC is to prepare students to meet the industry-specific educational needs for technicians in the new and emerging alternative and renewable energy fields, including (but not limited to) occupational titles such as: Electrical Engineering Technician, Industrial Engineering Technician, Solar Photovoltaic Installer and Solar Power Plant Technician, Solar Thermal Installer and Technician, Energy Auditor, and Smart Grid

Technician. This program also provides supplemental training for persons previously or currently employed in occupations related to energy production and storage, manufacturing and construction.

The content includes but is not limited to electronics, electricity and energy concepts; alternative energy sources and systems; energy storage, distribution and conversion; operation and performance of an alternative energy system; and policies and business practices affecting alternative energy occupations.

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

Standards

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

01.0 Demonstrate a fundamental understanding of electronics and electricity.
02.0 Demonstrate an understanding of industrial safety, health, and environmental requirements.
03.0 Characterize alternative energy sources and technologies.
04.0 Characterize the operation and performance of solar energy systems.
05.0 Apply policy, regulation and good business practices for alternative energy systems.

Florida Department of Education
Student Performance Standards

Program Title: **Alternative Energy Technology Specialist**
CIP Number: **0615050303**
Program Length: **18 credit hours (Primary), 15 credit hours (Secondary)**
SOC Code(s): **17-3023; 47-2231; 47-4099**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
01.01	Use appropriate grounding techniques.
01.02	Demonstrate knowledge of AC/DC theory.
01.03	Solve circuit problems using unit conversion and scientific notation.
01.04	Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
01.05	Solve problems in electric circuits involving power.
01.06	Solve problems involving series and parallel resistance circuits.
01.07	Solve problems involving capacitance in DC circuits.
01.08	Solve problems involving magnetic circuits.
01.09	Solve problems involving inductance in DC circuits.
01.10	Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
01.11	Solve problems on factors governing reactance in AC circuits.
01.12	Solve impedance problems in AC circuits.
01.13	Prepare and complete concise, neat and accurate lab reports.
02.0	Demonstrate an understanding of industrial safety, health, and environmental requirements--The student will be able to:
02.01	Communicate any new or revised safety procedures.
02.02	Update personnel about current safety guidelines.
02.03	Wear appropriate Personal Protective Equipment (PPE).
02.04	Follow area-posted safety guidelines.
02.05	Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA)).
02.06	Maintain a clean and safe work environment.

	02.07	Maintain personal protection equipment.
	02.08	Report unsafe conditions/practices.
	02.09	Locate emergency exits and alarms.
	02.10	Comply with company-established safety practices.
	02.11	Use appropriate firefighting procedures.
	02.12	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
	02.13	Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
	02.14	Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
	02.15	Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
	02.16	Demonstrate knowledge of incident reporting procedures.
	02.17	Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
	02.18	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
	02.19	Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.
03.0	Characterize alternative energy sources and technologies--The student will be able to:	
	03.01	Describe alternative and renewable energy sources used for power production.
	03.02	Define basic energy terms.
	03.03	Differentiate between alternative and renewable energy sources.
	03.04	Discuss the feasibility of emerging energy resources.
	03.05	Describe the major sources, scale, and impacts of alternative and renewable energy.
	03.06	Draw and label a diagram of an alternative and renewable energy system.
	03.07	Draw and label a diagram of energy production systems that uses various alternative energy sources.
	03.08	Distinguish between various alternative energy sources and energy potential.
	03.09	Describe the social and environmental impact of alternative energy technologies vs. traditional energy sources.
	03.10	Explain the difference between passive solar and active solar systems.
	03.11	Evaluate advantages and disadvantages of various alternative energy sources.
	03.12	Compare site selection requirements for various alternative energy installations.
	03.13	Compute cost/benefit analysis and return on investment calculations for a project.
	03.14	Evaluate local, state, and federal alternative energy rebates and incentives.
04.0	Characterize the operation and performance of solar energy systems--The student will be able to:	
	04.01	Describe the operation of various solar energy systems.

	04.02	Site a solar energy system for optimal production based on the sun's position.
	04.03	Distinguish between an azimuth and altitude calculation.
	04.04	Review the methodology for using an azimuth and altitude calculation to determine max output from a collector or concentrator.
	04.05	Specify components of solar energy systems.
	04.06	Calculate the energy produced, efficiency, and power derived from an installed system.
	04.07	Demonstrate proper safety practices in solar energy system installations and operations.
	04.08	Interpret basic schematics and sketches of various solar energy design configurations.
	04.09	Adapt the designs of solar energy systems for stand-alone and connected systems.
	04.10	Practice proper installation of solar energy system components.
	04.11	Demonstrate standard practices in system checkout, maintenance and troubleshooting a solar energy system.
	04.12	Determine appropriately sized components for a solar energy system.
	04.13	Describe benefits of alternative energy systems to the end customer through case studies.
05.0	Apply policy, regulation and good business practices for alternative energy systems--The student will be able to:	
	05.01	Define current US energy and natural resources policies and regulations.
	05.02	Compare and contrast US energy and natural resources policies and regulations to others around the world.
	05.03	Read and interpret facility energy utilization data.
	05.04	Use cost-benefit analyses to analyze various primary sources of energy.
	05.05	Discuss the effects of financial, technical, and economic trends on the past, current, and future energy industry.
	05.06	Demonstrate best practices for minimizing energy utilization.
	05.07	Apply best practices based for energy production and resources utilization.
	05.08	Determine how different climatic, geological, atmospheric, and human activities influence energy production and utilization.
	05.09	Identify conservation practices for natural resources used for energy production.
	05.10	Explain the environmental impacts of energy extraction, conservation, and storage systems.
	05.11	Discuss how the conversion to alternative energy affects various business sectors.
	05.12	Discuss the need for governmental regulations and policy for energy production and utilization.
	05.13	Compare and contrast local, state, and federal policy which positively and negatively effects the advancement of alternative energy investment and development.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Solar Energy Technician**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615050517
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours (Primary), 14 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 17-3026 – Industrial Engineering Technicians 17-3029 – Engineering Technicians, Except Drafters, All Other 49-9090 – Workers, Maintenance, All Other
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The program is designed to prepare individuals for employment as solar energy technicians, or to provide supplemental training for persons previously or currently employed in the electrical, plumbing or roofing industries. This program prepares individuals to assemble, install, operate, maintain, troubleshoot and repair solar thermal or photovoltaic equipment. Graduates of this program will be prepared to enter advanced training

and education in specialized electrical, plumbing, building construction, electronics and related fields. They may also be employed as trainees in the solar energy industry. The content includes, but is not limited to, DC circuits, AC circuits, solar thermal, and photovoltaic systems. Integrated into this content will be communications skills, leadership skills, human relations skills, employability skills, safe and efficient work practices, use of circuit diagrams and schematics, soldering, laboratory practices and technical recording and reporting.

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

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits.
03.0 Demonstrate proficiency in alternating current (AC) circuits.
04.0 Demonstrate proficiency in solar thermal systems.
05.0 Demonstrate proficiency in photovoltaic systems.
06.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Solar Energy Technician**
CIP Number: **0615050517**
Program Length: **12 credit hours (Primary), 14 credit hours (Secondary)**
SOC Code(s): **17-3023, 17-3026, 17-3029, 49-9090**

This certificate program is part of the Electronics Engineering Technology AS degree program (1615030301). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply proper Occupational Safety Health Administration (OSHA) safety standards.
01.02	Make proper electrical wire connections.
01.03	Identify and use hand tools properly.
01.04	Identify and use power tools properly.
01.05	Explain the theoretical concepts of soldering for plumbing.
01.06	Identify proper plumbing solder connections.
01.07	Demonstrate acceptable plumbing soldering techniques.
01.08	Demonstrate acceptable plumbing de-soldering techniques.
01.09	Demonstrate plumbing solder rework and repair techniques.
01.10	Demonstrate proficiency in the use of multimeters.
01.11	Demonstrate proficiency in the use of oscilloscopes.
01.12	Demonstrate proficiency in the use of function generators.
01.13	Demonstrate proficiency in the use of power supplies.
01.14	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Solve algebraic problems applied to DC circuits.
02.02	Solve problems in electronic units utilizing metric prefixes.
02.03	Relate electricity to the nature of matter.
02.04	Identify sources of electricity.
02.05	Define voltage, current, resistance, power and energy.

	02.06 Apply Ohm's law and power formulas.
	02.07 Read and interpret color codes and symbols to identify electrical components and values.
	02.08 Measure properties of a circuit using volt-ohm meters (VOMs) and digital voltohm meters (DVMs) meters and oscilloscopes.
	02.09 Compute conductance and compute and measure resistance of conductors and insulators.
	02.10 Apply Ohm's law and Kirchoff s voltage and current laws to series circuits.
	02.11 Construct and verify operation of series circuits.
	02.12 Analyze and troubleshoot series circuits.
	02.13 Apply Ohm's law and Kirchoff s voltage and current laws to parallel circuits.
	02.14 Construct and verify the operation of parallel circuits.
	02.15 Analyze and troubleshoot parallel circuits.
	02.16 Apply Ohm's law and Kirchoff's voltage and current laws to series-parallel and parallel-series circuits.
	02.17 Construct and verify the operation of series-parallel and parallel-series and bridge circuits.
	02.18 Troubleshoot series-parallel and parallel-series.
	02.19 Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
	03.01 Identify properties of an AC signal.
	03.02 Identify AC sources.
	03.03 Analyze and measure AC signals utilizing VOM, DVM, oscilloscope, frequency counter and function generator.
	03.04 Define the characteristics of polyphase circuits.
	03.05 Define basic motor theory and operation.
	03.06 Define basic generator theory and operation.
	03.07 Setup and operate power supplies for AC circuits.
	03.08 Analyze and measure power in AC circuits.
04.0	Demonstrate proficiency in solar thermal systems--The student will be able to:
	04.01 Create sun path charts and site solar irradiance audit.
	04.02 Explain how a passive solar thermal system works.
	04.03 Install solar thermal systems.
	04.04 Determine the best location for collector roof mounting.
	04.05 Understand the concepts of wind loading, collector and piping freeze protection.
	04.06 Size a solar thermal system based on family size and local solar irradiance.

	04.07 Explain how an active solar thermal system works.
	04.08 Install AC and DC water pumps, electronic controllers, and temperature sensors.
	04.09 Describe the latest Florida solar rebates, and federal solar tax credits.
05.0	Demonstrate proficiency in photovoltaic systems--The student will be able to:
	05.01 Determine the available solar resource and conduct site assessments for PV installations.
	05.02 Determine the performance and operating characteristics of PV systems and components.
	05.03 Define appropriate code-compliant configurations for PV systems and equipment.
	05.04 Plan and prepare for PV system installations, including customer relations, developing performance expectations, responsibilities and schedule.
	05.05 Implement and modify, as required, mechanical designs for PV systems that meet the performance, architectural and structural requirements for given applications.
	05.06 Implement and modify, as required, electrical designs for PV systems that meet the safety, code-compliance and functional requirements for given applications
	05.07 Conduct acceptance tests and inspections, and commission PV system installations.
	05.08 Evaluate, troubleshoot, and maintain PV systems.
	05.09 Describe the principles of Wind, Geothermal, Biomass, and tidal wave energy systems.
06.0	Demonstrate employability skills--The student will be able to:
	06.01 Conduct a job search.
	06.02 Secure information about a job.
	06.03 Identify documents that may be required when applying for a job.
	06.04 Complete a job application form correctly.
	06.05 Demonstrate competence in job interview techniques.
	06.06 Demonstrate knowledge of how to make appropriate decisions.
	06.07 Demonstrate appropriate work/behavioral habits.
	06.08 Demonstrate acceptable employee personal hygiene and health.
	06.09 Demonstrate knowledge of the Occupational Safety and Health Standard 29CFR-1910.1200, Hazard Communication.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Applied Technology Specialist**
Specialization Tract: **Advanced Technology**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615061203
Program Type	College Credit Certificate (CCC)
Program Length	16 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3029 – Engineering Technicians, Except Drafters, All Other
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to assembly, verification, testing, building and updating mechanical and electrical interfaces and systems.

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

Standards

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

01.0 Demonstrate a fundamental understanding of electronics and electricity.
02.0 Demonstrate proficiency in using tools, instruments and testing devices.
03.0 Demonstrate proficiency in soldering and basic laboratory practices.
04.0 Demonstrate proficiency in surface mount soldering.
05.0 Demonstrate proficiency in fiber optics terminations.

Florida Department of Education
Student Performance Standards

Program Title: **Applied Technology Specialist**
CIP Number: **0615061203**
Program Length: **16 credit hours**
SOC Code(s): **17-3029**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
01.01	Use appropriate grounding techniques.
01.02	Demonstrate knowledge of AC/DC theory.
01.03	Solve circuit problems using unit conversion and scientific notation.
01.04	Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
01.05	Solve problems in electric circuits involving work and power.
01.06	Solve problems involving series and parallel resistance circuits.
01.07	Solve problems involving capacitance in DC circuits.
01.08	Solve problems involving magnetic circuits.
01.09	Solve problems involving inductance in DC circuits.
01.10	Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
01.11	Solve problems on factors governing reactance in AC circuits.
01.12	Solve impedance problems in AC circuits.
01.13	Prepare and complete concise, neat and accurate lab reports.
02.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:
02.01	Identify and use hand tools properly.
02.02	Identify and use power tools properly.
02.03	Use inspection equipment appropriately.
02.04	Implement appropriate testing regimes.
02.05	Use appropriate measurement tools (e.g., micrometers, tapes. etc).
02.06	Use appropriate safety monitoring and testing equipment.

	02.07 Communicate issues with hand sketches.
	02.08 Use electronic measuring equipment and instruments.
	02.09 Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
03.0	Demonstrate proficiency in soldering basic laboratory practices--The student will be able to:
	03.01 Apply proper Occupational Safety Health Administration (OSHA) safety standards.
	03.02 Make electrical connections.
	03.03 Demonstrate acceptable soldering techniques.
	03.04 Demonstrate acceptable de-soldering techniques.
	03.05 Demonstrate electrostatic discharge (ESD) safety procedures.
	03.06 Describe the construction of printed circuit boards (PCB's).
	03.07 Explain the theoretical concepts of soldering.
	03.08 Demonstrate rework and repair techniques.
04.0	Demonstrate proficiency in basic surface mount soldering--The student will be able to:
	04.01 Identify SMD components.
	04.02 Understand concern specific to SMD components.
	04.03 Identify proper soldering techniques to each component type
	04.04 Solder and de-solder chip components.
	04.05 Solder and de-solder J-Leaded components.
	04.06 Solder and de-solder Gull Wing components.
	04.07 Effectively identify and demonstrate the quality requirements used to inspect soldered connections.
	04.08 Demonstrate the skills required for circuit board rework and repair.
	04.09 Demonstrate the proper selection and use of procedural requirements, tools, materials, and methods required to comply with the applicable standards.
05.0	Demonstrate proficiency in fiber optics termination--The student will be able to:
	05.01 Define the basics of a fiber optic system.
	05.02 Define the advantages and types of a fiber optic system.
	05.03 Understand how to install cables and prepare ends.
	05.04 Understand how to install different types of connectors.
	05.05 Understand how to make loss measurements.
	05.06 Understand how to install splices.
	05.07 Understand how to certify and troubleshoot a fiber system.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Lean Manufacturing**
Specialization Tract: **Advanced Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615061302
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3027 – Mechanical Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate proficiency in the use of quality assurance methods, quality control concepts
02.0 Identify and implement lean and six sigma concepts in manufacturing environments.
03.0 Identify, implement and/or interpret supply chain and operations management concepts and techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Lean Manufacturing**
CIP Number: **0615061302**
Program Length: **12 credit hours**
SOC Code(s): **17-3027**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in use of quality assurance methods, quality control concepts--The student will be able to:
01.01	Monitor processes for quality.
01.02	Inspect product for quality.
01.03	Document quality measurements or observations by filling out quality charts and records.
01.04	Compare process measurements to standards.
01.05	Identify root causes using standard techniques.
01.06	Identify Corrective Action and Preventive Action.
01.07	Describe the concept of quality assurance in increasing productivity and promoting zero defects.
01.08	Apply data collection methods for productivity improvement and reporting.
01.09	Analyze data using tools and techniques for productivity and quality problems.
01.10	Analyze data using tools and techniques for cause and effect relationships.
01.11	Develop and apply quality improvement strategies.
01.12	Demonstrate an understanding of a quality process's capability and its applications.
01.13	Demonstrate knowledge of how to implement quality assurance principles and methods.
01.14	Demonstrate knowledge of quality assurance checks for inspections.
01.15	Demonstrate an understanding of internal and external supply chains.
01.16	Demonstrate understanding of the configuration of management.
01.17	Demonstrate knowledge of standard industry practices regarding inventory control methods and procedures.
01.18	Demonstrate knowledge of production floor plan and safety requirements to place materials in most efficient and safe location and position.
01.19	Demonstrate knowledge of storage space available to establish lot sizes and reorder points.
01.20	Demonstrate knowledge of proper forecasts and methods for conducting inventory audits to recognize and report inventory discrepancies.

	01.21	Identify significant inventory discrepancies.
	01.22	Use cycle count process to ensure accurate counts are taken.
	01.23	Demonstrate knowledge of trade-off techniques (e.g., balance lead time and cycle time issues with inventory).
02.0	Identify and implement lean and six sigma concepts in manufacturing environments--The student will be able to:	
	02.01	Explain product manufacturing requirements.
	02.02	Construct process flow charts.
	02.03	Explain the role of management in production operations.
	02.04	Integrate personnel, hardware, and software capabilities for timely completion of products and product orders.
	02.05	Apply manufacturing resources planning and lean manufacturing principles to production and process planning.
	02.06	Demonstrate good examples of lean manufacturing principles of kanban, synchronized flows, perfect first-time quality, waste minimization, continuous improvement, flexibility, and building long lasting relationships with suppliers and customers.
	02.07	Implement minimization of wastes in the form of waiting time, inventory, processing, motion, over-production, transportation, and scrap.
	02.08	Apply the 5S's: Sort, Set in Order, Shine, Standardize, and Sustain.
	02.09	Use six sigma tools to identify opportunities and drive improvements.
	02.10	Apply the PDCA (plan–do–check–adjust) method in improvement activities.
	02.11	Participate in a continuous process improvement event involving multiple disciplines.
03.0	Identify, implement, and/or interpret supply chain and operations management concepts and techniques--The student will be able to:	
	03.01	Use appropriate software for supply chain management strategies.
	03.02	Illustrate how efficiency and effectiveness are necessary attributes of good operations management.
	03.03	Apply simulations used for layout and design of production operations.
	03.04	Apply engineering economy factors in equipment justification.
	03.05	Calculate machinery utilization.
	03.06	Demonstrate warehouse throughput systems.
	03.07	Demonstrate basic principles and methods of controlling work in progress.
	03.08	Follow raw materials from their source to distribution of the product.
	03.09	Develop strategies to identify improvement opportunities, prioritize and develop an implementation plan optimize production operations.
	03.10	Demonstrate strategies to optimize raw materials and products inventories to minimize waste

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Pneumatics, Hydraulics and Motors for Manufacturing**
Specialization Tract: **Advanced Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615061303
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3027 – Mechanical Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Demonstrate an understanding of industrial processes and material properties.
02.0 Demonstrate a fundamental understanding of electronics and electricity.
03.0 Understand, operate, troubleshoot, and maintain pneumatic, hydraulic, and electromechanical components and/or systems.

Florida Department of Education
Student Performance Standards

Program Title: **Pneumatics, Hydraulics and Motors for Manufacturing**
CIP Number: **0615061303**
Program Length: **12 credit hours**
SOC Code(s): **17-3027**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of industrial processes and materials properties--The student will be able to:
01.01	Demonstrate knowledge of current manufacturing processes.
01.02	Demonstrate knowledge of the use of current manufacturing machines, operating systems and mechanisms.
01.03	Estimate manpower needs and skills needed in assembly operations.
01.04	Demonstrate knowledge of the criteria for tool design, maintenance, procurement and handling.
01.05	Demonstrate knowledge of gage design, usage and limitations.
01.06	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for automated systems.
01.07	Demonstrate knowledge of processes used to ensure that changes do not negatively impact production or product.
01.08	Demonstrate knowledge of production timing to ensure customer satisfaction and on-time delivery.
01.09	Demonstrate knowledge of time and motion to enhance productivity.
01.10	Make continuous adjustments to equipment and procedures that result in improved productivity.
01.11	Demonstrate knowledge of how raw materials are moved.
01.12	Setup or modify new equipment per engineering specifications and documentations.
01.13	Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment on operations.
02.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
02.01	Use appropriate grounding techniques.
02.02	Demonstrate knowledge of AC/DC theory.
02.03	Solve circuit problems using unit conversion and scientific notation.
02.04	Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
02.05	Solve problems in electric circuits involving work and power.
02.06	Solve problems involving series and parallel resistance circuits.

	02.07 Solve problems involving capacitance in DC circuits.
	02.08 Solve problems involving magnetic circuits.
	02.09 Solve problems involving inductance in DC circuits.
	02.10 Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
	02.11 Solve problems on factors governing reactance in AC circuits.
	02.12 Solve impedance problems in AC circuits.
	02.13 Prepare and complete concise, neat and accurate lab reports.
03.0	Understand, operate, troubleshoot, and maintain pneumatic, hydraulic and electromechanical components and/or systems–The student will be able to:
	03.01 Identify, classify and describe the function of pneumatic, hydraulic and electrical machines and components.
	03.02 Construct flow diagrams of pneumatic, hydraulic, and electromechanical systems.
	03.03 Perform basic operation maintenance of pneumatic, hydraulic and electromechanical components, devices and/or machines.
	03.04 Understand maintenance requirements.
	03.05 Troubleshoot errors, faults, and inconsistencies in pneumatic, hydraulic and electromechanical components, machines and/or systems.
	03.06 Define special applications of electromechanical, hydraulic and pneumatic machines and devices used in processing sheet metal, metal cutting processing, plastics, food and beverages, injection molding, thermal molding and bulk processing equipment.
	03.07 Describe important limitations of electromechanical, pneumatic and hydraulic machinery.
	03.08 Operate independent pneumatic, hydraulic and electrical machines properly.
	03.09 Describe the important operating parameters of pneumatic, hydraulic and electrical machines and/systems.
	03.10 Identify and use appropriate monitoring gages for pneumatic, hydraulic, and electromechanical machines and/or systems.
	03.11 Use safe practices while operating, troubleshooting and maintaining industrial equipment.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Six Sigma Black Belt Certificate**
Specialization Tract: **Quality**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615070202
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3026 – Industrial Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to the six sigma methodology of problem solving, strategic improvement, business transformation and process improvement. The specifics of this certificate program will focus on the theory and application of methods to improve the quality of process outputs by identifying and removing the causes of defects and minimizing variability in manufacturing or business processes. Six Sigma uses a set of quality management methods including statistical methods to improve customer satisfaction, reduce cycle time, and reduce defects.

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

Standards

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

01.0 Demonstrate proficiency in Six Sigma theories.
02.0 Demonstrate proficiency in developing a Six Sigma project.

Florida Department of Education
Student Performance Standards

Program Title: **Six Sigma Black Belt Certificate**
CIP Number: **0615070202**
Program Length: **12 credit hours**
SOC Code(s): **17-3026**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in Six Sigma theories--The student will be able to:
01.01	Apply the five steps of the DMAIC model.
01.02	Establish an advanced quality plan using the theories of Six Sigma.
01.03	Develop the basic cause-and-effect diagram (fishbone diagram).
01.04	Describe and develop the central limit theorem.
01.05	Develop a control plan to aid in production.
01.06	Define the cost-benefit analysis on the shop floor.
01.07	Define and describe the design of experiments (DOE) used in manufacturing processes.
01.08	Run the experiment.
01.09	Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
01.10	Apply the techniques of Process Failure Modes and Effects Analysis (pFMEA).
01.11	Define and describe risk assessment.
01.12	Implement the 5S's method of sorting, setting in order, shining, standardizing, and sustaining.
01.13	Maintain and check the process through quality auditing.
02.0	Demonstrate proficiency in developing a Six Sigma project--The student will be able to:
02.01	Frame and Detail a Capstone Project using the Six Sigma tools.
02.02	Describe the economic evaluation of engineering alternatives and analysis of cost allocation.
02.03	Calculate net profit, marginal rate of returns, maximum profit, return on investment, cash flow analysis and breakeven points when solving problems.
02.04	Solve problems involving alternative designs, materials, or methods.
02.05	Analyze the factor of equivalence in engineering economic problems.
02.06	Solve problems related to replacement versus augmentation for economic choices.

02.07	Discuss how capital projects are identified and evaluated (Return on Investment -ROI)
02.08	Describe how final projects are selected.
02.09	Define the requirements of the project plan.
02.10	Develop the initial project schedule.
02.11	Describe each phase of the project as it relates to the budget.
02.12	Develop timeline charts for planning and tracking.
02.13	Apply the scheduling control systems.
02.14	Identify the voice of the customer as the feedback mechanism.
02.15	Define and describe the scheduling techniques when applied in the project environment.
02.16	Apply the six sigma methodology to service type environments.
02.17	Apply the Theory of Constraints to identify the obstacles, lean to remove the obstacles, and six sigma to create the standard of work and remove variations.
02.18	Understand the requirements for a successful implementation of six sigma using customer centric approach, organizational alignment, and quality improvement and how they are interdependent.
02.19	Align the Six Sigma project objectives to business strategy, and prioritize projects accordingly.
02.20	Use data collection strategies and graphical analysis in the project environment.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. The Capstone Project systematically bridges the Six Sigma Methodology and theory with actual hands-on application of the various DMAIC Tools in support of variation reduction. These activities include application and instruction in the use of Six Sigma tools, statistics, project management, engineering analysis, financial analysis and supporting materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on project based experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Lean Six Sigma Green Belt Certificate**
Specialization Tract: **Quality**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615070203
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3026 – Industrial Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to, the concepts, theories, and tools of the Lean Manufacturing and Six Sigma as used in the manufacturing and services industries. The program covers the methods used in Lean and Six Sigma such as: continuous flow, overall equipment effectiveness (OEE), Kaizen, process mapping, the 5S's, total productive maintenance (TPM), cellular manufacturing, the DMAIC, self-directed work teams, the kanban system, design for manufacturing, and value steam mapping.

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

Standards

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

01.0 Demonstrate proficiency in lean manufacturing/production.
02.0 Demonstrate proficiency in developing self-directed work teams.
03.0 Demonstrate proficiency in the tools of lean manufacturing.
04.0 Demonstrate proficiency in basic Six Sigma concepts.

Florida Department of Education
Student Performance Standards

Program Title: **Lean Six Sigma Green Belt Certificate**
CIP Number: **0615070203**
Program Length: **12 credit hours**
SOC Code(s): **17-3026**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in lean manufacturing/production--The student will be able to:
01.01	Describe and explain the concepts of lean manufacturing.
01.02	Apply the theories of lean manufacturing to a manufacturing and service environment for improvement.
01.03	Identify and apply value stream mapping and other mapping methods.
01.04	Identify and apply just-in-time procedures.
01.05	Identify and apply the techniques in continual improvement.
01.06	Describe and explain the system of waste–free manufacturing (WFM).
01.07	Describe the changes necessary in implementing waste-free manufacturing in a lean environment.
01.08	Describe and explain supply chain management.
01.09	Describe and explain the use of the 5S's, (sort, set in order, shine, standardize, sustain).
01.10	Develop the techniques to manage change in the manufacturing environment.
01.11	Describe the concept of Nidoka, Heijunka, and quick changeover.
02.0	Demonstrate proficiency in developing self-directed work teams--The student will be able to:
02.01	Describe and explain how teams are developed.
02.02	Demonstrate how effective team members operate.
02.03	Identify the organization techniques of starting a team.
02.04	Identify the limits and expectations of the team.
02.05	Describe team problems.
02.06	Create work plans.
02.07	Identify the steps in ending a project.
02.08	Use data effectively in identifying issues.

	02.09 Implement changes through planning and communications.
	02.10 Update appropriate documentation in a project.
	02.11 Identify the steps in ending a project.
03.0	Demonstrate proficiency in the tools of lean manufacturing--The student will be able to:
	03.01 Define the tools required to implement and maintain a Lean Manufacturing facility.
	03.02 Describe and explain mistake proofing for operators.
	03.03 Describe the techniques using zero quality control (ZQC) techniques in manufacturing settings.
	03.04 Identify mistake proof devices for eliminating errors in manufacturing.
	03.05 Describe and apply the 5S's for efficiency, maintenance, and continuous improvement.
	03.06 Describe and explain the visual workplace environment.
	03.07 Define the terms associated with the quick changeover process.
	03.08 Identify the changeover techniques used in production.
	03.09 Describe and explain the streamlining process to reduce changeover time.
	03.10 Describe the terms used in overall equipment effectiveness (OEE).
	03.11 Describe and explain the process of total productive maintenance (TPM).
	03.12 Describe and explain tracking process in improving the effectiveness of the operating equipment.
	03.13 Define the terms associated with basic cellular manufacturing concepts.
	03.14 Identify production teams to basic cellular manufacturing and teamwork concepts.
	03.15 Identify steps required to convert to a cellular arrangement.
	03.16 Identify the techniques used in the kanban system for just-in-time (JIT).
04.0	Demonstrate proficiency in basic Six Sigma concepts--The student will be able to:
	04.01 Describe and explain the basic principles and theories of Six Sigma.
	04.02 Define the terms associated with Six Sigma.
	04.03 Describe the philosophy and methodology of Six Sigma.
	04.04 Define the five steps of the DMAIC (define, measure, analyze, improve, and control) model used in Six Sigma for quality improvement.
	04.05 Establish an advanced quality plan.
	04.06 Benchmark a project.
	04.07 Develop the basic cause-and-effect diagram (fishbone diagram).
	04.08 Describe and develop the central limit theorem.
	04.09 Develop a control plan to aid in production.

04.10	Define the cost-benefit analysis on the shop floor.
04.11	Define and describe the design of experiments (DOE) used in manufacturing processes.
04.12	Run the experiment.
04.13	Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
04.14	Apply the techniques of Process Failure Modes and Effects Analysis (pFMEA).
04.15	Define and describe risk assessment.
04.16	Implement the 5S's method of sorting, setting in order, shining, standardizing, and sustaining.
04.17	Maintain and check the process through quality auditing.
04.18	Apply the Six Sigma standards to non-manufacturing environments.
04.19	Describe the role that other continuous process improvement efforts play in the workplace.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **CNC Composite Fabricator/Programmer**
Specialization Tract: **Mechanical Design and Fabrication**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615080501
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer-aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Generate and interpret computer-aided drawings.
02.0 Demonstrate proficiency in the principles, concepts and applications in woodworking and composite fabrication methods.
03.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
04.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.

Florida Department of Education
Student Performance Standards

Program Title: **CNC Composite Fabricator/Programmer**
CIP Number: **0615080501**
Program Length: **12 credit hours**
SOC Code(s): **51-4012**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Generate and interpret computer-aided drawings--The student will be able to:
01.01	Apply current industrial computer aided-drawing practices.
01.02	Construct geometric figures.
01.03	Create and edit text formatted to industry standards.
01.04	Use and control accuracy-enhancement tools for entity-positioning methods.
01.05	Identify, create, store, and use standard part symbols and libraries.
01.06	Control entity properties by layer, color, and line type.
01.07	Use viewing commands to perform zooming and panning.
01.08	Use query commands to interrogate database for entity characteristics.
01.09	Plot drawings on media using layout and scale.
01.10	Prepare drawings for flexibility of future editing and minimum file size.
01.11	Apply standard dimensioning rules.
01.12	Demonstrate proficiency importing and exporting various files types.
01.13	Operate related peripheral devices.
01.14	Read and interpret technical drawings to assure conformity of product.
01.15	Demonstrate skill in assessing and reading schematics and drawings.
02.0	Demonstrate proficiency in the principles, concepts and applications in woodworking and composite fabrication methods--The student will be able to:
02.01	Demonstrate the safe and proper use of and the basic adjustments and maintenance according to the manufacturer's recommendations for the following equipment, to include but not limited to:
02.01.1	Saws
02.01.2	Planers

	02.01.3 Jointers
	02.01.4 Routers
	02.01.5 Lathes
	02.01.6 Drills
	02.01.7 Nailers
	02.01.8 Dust Collection
02.02	Set up and apply the use of clamps and vices.
02.03	Apply and use basic safety equipment (PPE).
02.04	Apply OSHA safety rules concerning PPE for eye protection.
02.05	Apply OSHA safety rules concerning PPE for hearing protection.
02.06	Identify and describe common wood working joints.
02.07	Demonstrate the use of wood glues, adhesives and epoxies.
02.08	Identify and describe rip, cross, miter, bevel, compound, and curved wood cuts.
02.09	Use wood stains and sealers.
02.10	Apply standard lumber dimensioning methods.
02.11	Identify and use basic woodworking layout tools.
02.12	Analyze lumber distortions and defects.
02.13	Define categories of hard and soft woods.
02.14	Demonstrate or identify CNC router set-up and operation.
03.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:
03.01	Set up and maintain a manual and/or CNC machining centers.
03.02	Demonstrate processes using manual and/or CNC machining centers.
03.03	Demonstrate acceptable control of machining processes.
03.04	Identify and define chip formation, load and material removal rates.
03.05	Demonstrate the characteristics of machining cutting tools.
03.06	Identify or define cutting tool geometry and cutting tool materials to select tools for CNC machining.
03.07	Demonstrate efficient CNC machining processes.
03.08	Demonstrate the process to drill and layout holes to a specific size.
03.09	Identify part layout techniques.
03.10	Demonstrate machining procedures used in CNC programming.

03.11	Identify grinding machining practices and processes.
03.12	Demonstrate threading and tapping processes.
03.13	Identify metal alloys and their properties in machining.
03.14	Demonstrate job planning procedures in machining.
03.15	Calculate cutting tool speeds and feeds.
03.16	Adjust RPM of machining equipment.
03.17	Identify coordinate and primary machining axes.
03.18	Define and describe absolute and incremental coordinates.
03.19	Identify the five basic CNC drive components.
03.20	Demonstrate rapid travel and interpolation.
03.21	Identify coordinate and primary machining axes.
03.22	Identify and define manual and CNC machining operations.
03.23	Read and edit CNC programs.
03.24	Demonstrate acceptable procedures in starting CNC machines.
03.25	Demonstrate the CNC machine controls for set up and operation.
03.26	Demonstrate acceptable procedures to set up a CNC Machining center.
03.27	Demonstrate acceptable procedures to run programs using a CNC machining center.
03.28	Demonstrate acceptable procedures to generate a CNC program.
03.29	Demonstrate acceptable procedures in CNC job planning.
03.30	Select cutting tools, collets and holding fixtures.
03.31	Identify CNC tooling and applications.
03.32	Define CNC programming code words and conventions.
03.33	Define and demonstrate CNC program fixed cycles.
03.34	Demonstrate use of CAD/CAM software and processes.
03.35	Produce student generated projects.
04.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software–The student will be able to:
04.01	Create CAD/CAM geometry for tool path processing.
04.02	Demonstrate procedures to import/export CAD/CAM files.
04.03	Demonstrate contouring using CAM tool path commands.
04.04	Apply pocketing using CAM tool path commands.

04.05	Demonstrate drill cycles using CAM tool path commands.
04.06	Demonstrate thread cycles using CAM tool path commands.
04.07	Demonstrate engraving using CAM tool path commands.
04.08	Construct lettering using CAM tool path commands.
04.09	Demonstrate nesting using CAM tool path commands.
04.10	Describe procedures for CAM post-processing.
04.11	Apply tool path verification for a CAM program.
04.12	Demonstrate tool-path operations using CAM software.
04.13	Demonstrate ability to save, copy, delete, and rename computer files.
04.14	Create a CAD/CAM working portfolio.
04.15	Demonstrate the use of back plotting in a cam program.
04.16	Demonstrate how to modify an existing tool path.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Mechanical Designer and Programmer**
Specialization Tract: **Mechanical Design and Fabrication**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615080503
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	51-4011 – Computer-Controlled Machine Tool Operators, Metal and Plastic 51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic 27-1021 – Commercial and Industrial Designers
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to theory and application of solid modeling techniques used in product design and fabrication. At completion students are qualified to take the certification exam offered by Solid Works. Students will also be introduced to computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling

protocols, and proper usage of tools and instrumentation. The program explores additive machine processes (rapid prototyping) which will enable a student to become proficient in technological advances within the industry such as 3-D printing.

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

Standards

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

01.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
02.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.
03.0 Demonstrate proficiency in solid modeling design and programming.

Florida Department of Education
Student Performance Standards

Program Title: **Mechanical Designer and Programmer**
CIP Number: **0615080503**
Program Length: **12 credit hours**
SOC Code(s): **51-4011, 51-4012, 27-1021**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:
01.01	Set up and maintain a manual and/or CNC machining centers.
01.02	Demonstrate processes using manual and/or CNC machining centers.
01.03	Demonstrate acceptable control of machining processes.
01.04	Identify and define chip formation, load and material removal rates.
01.05	Demonstrate the characteristics of machining cutting tools.
01.06	Identify or define cutting tool geometry and cutting tool materials to select tools for CNC machining.
01.07	Demonstrate efficient CNC machining processes.
01.08	Demonstrate the process to drill and layout holes to a specific size.
01.09	Identify part layout techniques.
01.10	Demonstrate machining procedures used in CNC programming.
01.11	Identify grinding machining practices and processes.
01.12	Demonstrate threading and tapping processes.
01.13	Identify metal alloys and their properties in machining.
01.14	Demonstrate job planning procedures in machining.
01.15	Calculate cutting tool speeds and feeds.
01.16	Adjust RPM of machining equipment.
01.17	Identify coordinate and primary machining axes.
01.18	Define and describe absolute and incremental coordinates.
01.19	Identify the five basic CNC drive components.
01.20	Demonstrate rapid travel and interpolation.

01.21	Identify coordinate and primary machining axes.
01.22	Identify and define manual and CNC machining operations.
01.23	Read and edit CNC programs.
01.24	Demonstrate acceptable procedures in starting CNC machines.
01.25	Demonstrate the CNC machine controls for set up and operation.
01.26	Demonstrate acceptable procedures to set up a CNC Machining center.
01.27	Demonstrate acceptable procedures to run programs using a CNC machining center.
01.28	Demonstrate acceptable procedures to generate a CNC program.
01.29	Demonstrate acceptable procedures in CNC job planning.
01.30	Select cutting tools, collets and holding fixtures.
01.31	Identify CNC tooling and applications.
01.32	Define CNC programming code words and conventions.
01.33	Define and demonstrate CNC program fixed cycles.
01.34	Demonstrate use of CAD/CAM software and processes.
01.35	Produce student generated projects.
02.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software--The student will be able to:
02.01	Create CAD/CAM geometry for tool path processing.
02.02	Demonstrate procedures to import/export CAD/CAM files.
02.03	Demonstrate contouring using CAM tool path commands.
02.04	Apply pocketing using CAM tool path commands.
02.05	Demonstrate drill cycles using CAM tool path commands.
02.06	Demonstrate thread cycles using CAM tool path commands.
02.07	Demonstrate engraving using CAM tool path commands.
02.08	Construct lettering using CAM tool path commands.
02.09	Demonstrate nesting using CAM tool path commands.
02.10	Describe procedures for CAM post-processing.
02.11	Apply tool path verification for a CAM program.
02.12	Demonstrate tool-path operations using CAM software.
02.13	Demonstrate ability to save, copy, delete, and rename computer files.
02.14	Create a CAD/CAM working portfolio.

	02.15 Demonstrate the use of back plotting in a cam program.
	02.16 Demonstrate how to modify an existing tool path.
03.0	Demonstrate proficiency in solid modeling design and programming--The student will be able to:
	03.01 Identify wire frame geometry for surface modeling.
	03.02 Demonstrate tool path verification and post processing.
	03.03 Create a 3D wire frame in different construction planes.
	03.04 Demonstrate Geometry editing commands.
	03.05 Create a solid body applying extruding commands.
	03.06 Demonstrate the programming parameters using high speed machining tooling.
	03.07 Demonstrate CNC tooling selection and applications.
	03.08 Demonstrate the chamfer command on a solid body.
	03.09 Apply the revolve command by editing a solid body.
	03.10 Demonstrate the fillet command on a solid body.
	03.11 Create a wire frame model for a ruled surface.
	03.12 Construct a sphere using primitive commands.
	03.13 Apply primitive commands to construct a cylinder.
	03.14 Edit solid geometry using loft commands.
	03.15 Demonstrate the use of default short-cut key assignments.
	03.16 Construct coons wire frame geometry.
	03.17 Create sweep surfaces and flow line tool path.
	03.18 Demonstrate raised letters on a surface.
	03.19 Demonstrate stock set-up for tool path creation.
	03.20 Identify and research emerging technologies used in 3-D modeling.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Computer-Aided Design and Drafting**
Specialization Tract: **Digital Design and Modeling**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0615130304
Program Type	College Credit Certificate (CCC)
Program Length	24 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-2051 – Civil Engineers 17-3019 – Drafters, All Other 17-3012 – Electrical and Electronics Drafters 27-1029 – Designers, All Other 17-3026 – Industrial Engineering Technicians 17-3013 – Mechanical Drafters
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to specialized courses in Applied Technology areas for design, assembly, and fabrication using various software packages.

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

Standards

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

01.0 Demonstrate proficiency in advanced CAD commands.
02.0 Demonstrate proficiency in three-dimensional (3-D) drawings.
03.0 Demonstrate knowledge of using solid (3D) modeling software.
04.0 Demonstrate proficiency in engineering design fundamentals.
05.0 Demonstrate proficiency in solid modeling fundamentals.

Florida Department of Education
Student Performance Standards

Program Title: **Computer-Aided Design and Drafting**
CIP Number: **0615130304**
Program Length: **24 credit hours**
SOC Code(s): **17-2051, 17-3019, 17-3012, 27-1029, 17-3026, 17-3013**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in advanced CAD commands–The student will be able to:
01.01	Select the correct command for specified tasks.
01.02	Develop the standard drawing arraignment needed for generic information layout for specific drawing types.
01.03	Demonstrate proficiency in various CAD plotting and printing options.
01.04	Create and plots multiple size of drawings.
01.05	Develop the attributes and standards needed for generic information for drawing templates for specific drawings.
01.06	Implement existing CAD library files for new drawings.
01.07	Develop appropriate new library files when necessary.
01.08	Demonstrate model space and paper space commands.
01.09	Demonstrate paper space with multi Layout sheets.
01.10	Apply standard dimensioning rules for Architectural, Mechanical, and Electrical.
02.0	Demonstrate proficiency in three-dimensional (3-D) drawings–The student will be able to:
02.01	Implement the CAD commands for three-dimensional drawings.
02.02	Implement and apply the CAD three-dimensional coordinate system for three-dimensional objects.
02.03	Use CAD three-dimensional surface commands for 3-dimensional objects.
02.04	Implement and apply basic software utilities for arranging, detailing, and plotting views of an object.
02.05	Create basic building construction, architectural and object designs in three dimensions.
02.06	Align, rotate, and mirror three-dimensional objects.
02.07	Render a three-dimensional model.
02.08	Customize screen, toolbars, and pull down menus.
03.0	Demonstrate knowledge of using solid (3-D) modeling software–The student will be able to:

03.01	Create a new part document and 2-D sketch views of a solid object in drawing environment.
03.02	Apply and edit dimensions on an object.
03.03	Create the standard drawing views to document the design procedures.
03.04	Perform analyses on the computer model and refine the design.
03.05	Measure and calculate properties of parts.
03.06	Enter, save, and modify data for a part drawing.
03.07	Create bottom-up assembly drawings.
03.08	Define parts and components of an assembly in a BOM link to an Excel directory.
03.09	Define parts of an assembly in a directory by Balloons or Labeling.
03.10	Apply orthographic projection principles to drawing's layouts.
03.11	Plot solid modeling drawings.
04.0	Demonstrate proficiency in engineering design fundamentals–The student will be able to:
04.01	Create and execute advanced templates.
04.02	Convert multiple sketches into construction lines.
04.03	Create and use multiple work planes for advanced functions.
04.04	Create and modify bottom up assemblies.
04.05	Create multiple configurations of an individual part.
04.06	Apply basic drawing concepts to molded parts.
04.07	Create basic sheet metal drawings.
04.08	Create two and three-dimensional drawings related to graphic and industrial design.
04.09	Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
04.10	Demonstrate basic design principles of visual and spatial form as applied to products.
04.11	Perform analyses and refine industrial design.
04.12	Apply design features to the two and three dimensional drawings.
04.13	Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
04.14	Describe the theories related to product and systems design.
04.15	Solve elementary problems related to the form and function of objects and structures.
04.16	Describe the fundamentals of material selection for product and system design.
04.17	Conduct a system design identifying the major phases.
04.18	Analyze three-dimensional solid elements and 3-D thin shell bodies.

	04.19 Plot three-dimensional objects.
	04.20 Implement sustainable practices in simulation design analysis.
05.0	Demonstrate proficiency in solid modeling fundamentals–The student will be able to:
	05.01 Convert sketches into extruded features.
	05.02 Create the desired sketch to show the design intent in the solid modeling procedures.
	05.03 Perform analyses on the sketch procedures and refine the sketch to be fully defined.
	05.04 Create multiple parts using configurations manager on the design tree.
	05.05 Perform advanced mating using multiple parts or sub-assemblies.
	05.06 Define the type of analysis of machine elements of a parts or assembly.
	05.07 Combine 11-13 Perform and interpret finite element analysis on modeled objects.
	05.08 Apply basic drawing concepts to molded parts.
	05.09 Create detailed molds or die cavities of parts and assemblies.
	05.10 Derive component parts from an edited mold base.
	05.11 Choose and apply a type of material to use to render parts.
	05.12 Create and insert render parts into the sheet environment of a solid modeling drawing.
	05.13 Apply the rapid prototyping processes for specific applications.
	05.14 Fabricate a part or an assembly using a rapid prototype machine.
	05.15 Describe the processes used in reverse engineering and scanning.
	05.16 Apply reverse engineering or scanning processes for specific applications.
	05.17 Fabricate a part or an assembly using reverse engineering or scanning equipment.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program and include the proper use of software, computers, plotters, and rapid prototype machines. These activities include instruction in the use of safety procedures for all equipment.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Students are urged to join the local and national AutoCAD and Solid Modeling user groups.

Special Notes

The cooperative method of instruction may be utilized for this program. Whenever the cooperative method 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.

To be transferable statewide between institutions, this program/course 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.

When a secondary student with a disability is enrolled in a vocational class for which modifications to the curriculum framework have been made, the particular outcomes and student performance standards that the 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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student’s Individual Educational Plan (IEP) or 504 plan or postsecondary student’s accommodations’ plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Biotechnology Specialist**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0626120101
Program Type	College Credit Certificate (CCC)
Program Length	19 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4021 – Biological Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Biotechnology AS degree program (1626120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to broad biology and chemistry concepts, algebraic analysis, documentation procedures, basic laboratory techniques and concepts, as well as biohazard and safety procedures.

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

Standards

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

01.0 Demonstrate communication skills.
02.0 Demonstrate safety skills.
03.0 Demonstrate basic laboratory skills.
04.0 Demonstrate regulatory compliance.
05.0 Demonstrate appropriate decision making and problem solving techniques.
06.0 Demonstrate quality assurance/control.
07.0 Maintain facility and equipment.

Florida Department of Education
Student Performance Standards

Program Title: **Biotechnology Specialist**
CIP Number: **00626120101**
Program Length: **19 credit hours**
SOC Code(s): **19-4021**

This certificate program is part of the Biotechnology AS degree program (1626120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate communication skills--The student will be able to:
01.01	Make professional oral and written presentations.
01.02	Comprehend and use correct technical vocabulary.
01.03	Follow/analyze experimental and lab protocols.
01.04	Keep accurate lab records in notebooks. (hand written and electronically)
01.05	Review and maintain notes on procedures. (hand written and electronically)
01.06	Prepare identify and apply changes to control procedures.
01.07	Write or update manuals, SOP's protocols, reports and technical summaries.
01.08	Perform computerized research and web searches, including, but not limited to Pub Med.
01.09	Read technical literature, including, but not limited to original research articles.
01.10	Identify basic reference resources in biotechnology, including, but not limited to original journal articles.
01.11	Perform basic applications in word processing, spread sheets, databases, presentations and project management.
01.12	Make professional oral and written presentations.
02.0	Demonstrate safety skills--The student will be able to:
02.01	Identify first aid supplies, eye wash station, emergency shower, co-worker contact, medical information, and emergency protection and evacuation plan.
02.02	Follow correct safety procedures, guidelines and chemical hygiene plans.
02.03	Maintain required environmental health & safety, and lab animal training.
02.04	Maintain a safe, uncluttered and clean work area.
02.05	Maintain and utilize safety equipment and personal protection equipment.
02.06	Check expiration dates, lot numbers and labels for chemical and hazardous substances.
02.07	Monitor usage and exposure to hazardous materials, and keep appropriate usage logs.

	02.08	Handle, store and dispose of waste and hazardous materials per SDS, other safety guidelines and Worker Protection Standards (WPS).
	02.09	Follow universal precautions for biological pathogens, both proper handling and disposal.
	02.10	Store and label chemicals and biologicals according to industry recognized storage guidelines.
03.0	Demonstrate basic laboratory skills--The student will be able to:	
	03.01	Obtain and read protocol, test procedure, standard operating procedure (SOP), equipment manuals, and proper forms.
	03.02	Prioritize and perform multiple tasks in a timely manner, based upon priorities communicated by supervisor.
	03.03	Clean, organize and sterilize materials and lab instruments, when required.
	03.04	Check and maintain equipment, logs and perform preventative maintenance tasks according to schedule.
	03.05	Order inventory of supplies; date/label reagents. Store promptly upon arrival.
	03.06	Practice aseptic technique.
	03.07	Use titration/pipetting techniques; measure volume/weights precisely.
	03.08	Perform basic calculations and statistical analysis using appropriate software.
	03.09	Calculate and prepare dilutions series.
	03.10	Prepare solutions and reagents for laboratory use.
	03.11	Monitor physical properties of reagents, buffers, media and solutions and determine optimum conditions for use.
	03.12	Obtain and review appropriate procedures and test forms, prepare for lab inspections and respond to the reports.
	03.13	Collect and set up samples for analysis.
	03.14	Set up general laboratory tests, including, setup equipment and perform/document tests and results.
	03.15	Operate laboratory equipment and instrumentation after familiarization with manuals and or training, which may include the following, but not limited to: Thermocycler, microscopes, fluorimeter, hoods, centrifuge, polarimeter, pH meter, chart recorder, stirrers, balance, conductivity meter, mixers, autoclave, power supply, shakers, dry heat ovens, incubator, Bunsen burner, scintillation counter, high pressure liquid chromatography, gas chromatography/mass spectrometry.
04.0	Demonstrate regulatory compliance--The student will be able to:	
	04.01	Follow guidelines from the appropriate regulatory, accreditation, and/or certification agencies, such as FDA, OSHA, USDA, NIH, NR, DOT, EPA, CDC, ISO/IEC and NRC.
	04.02	Accept and follow state, local and industry regulations.
	04.03	Perform manufacturing processes using current continuous quality improvement practices.
05.0	Demonstrate appropriate decision making and problem solving techniques--The student will be able to:	
	05.01	Identify decision to be made, compare alternatives, and discuss alternatives with supervisor.
	05.02	Apply decision making skills in the workplace.
	05.03	Make decisions based on accurate facts, data, and agreed-upon goals.

	05.04 Evaluate the decision made quantitatively and qualitatively.
	05.05 Apply problem solving techniques in the workplace.
	05.06 Diagnose problem, its urgency and causes, and documenting as appropriate.
	05.07 Compare and contrast advantages/disadvantages for solutions to a problem.
	05.08 Determine appropriate action; implement it and evaluate results.
06.0	Demonstrate quality assurance/control--The student will be able to:
	06.01 Perform quality tests and document results.
	06.02 Verify test standards and maintain QA records.
	06.03 Archive samples and documents.
	06.04 Inspect and verify integrity of product, procedure, and specimen.
	06.05 Release final product and perform trend analysis.
	06.06 Investigate complaints and take corrective action.
07.0	Maintain facility and equipment--The student will be able to:
	07.01 Monitor/record the environmental condition of the facility (growth chamber, laboratory, greenhouse, seed storage room, animal room or manufacturing site).
	07.02 Notify appropriate personnel if sampling indicates a problem.
	07.03 Clean work area according to SOPs.
	07.04 Label equipment.
	07.05 Check calibration and perform systems diagnostics
	07.06 Perform or schedule preventive maintenance.
	07.07 Maintain equipment logs.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Medical Quality Systems**
Specialization Tract: **Biomedical Systems**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0641010105
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	29-2071 – Medical Records and Health Information Technicians 31-9092 – Medical Assistants 29-2012 – Medical and Clinical Laboratory Technicians 51-9082 – Medical Appliance Technicians 11-9111 – Medical and Health Services Managers 17-2031 – Biomedical Engineers 19-4021 – Biological Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to specialized courses used in the medical device manufacturing areas in quality assurance.

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

Standards

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

01.0 Demonstrate knowledge of the Food and Drug Administration (FDA) regulations and compliance for biomedical systems.
02.0 Demonstrate knowledge in the design and manufacture of biomedical systems.
03.0 Demonstrate knowledge of risk management for biomedical products development and production.
04.0 Demonstrate knowledge of quality audits for biomedical systems.

Florida Department of Education
Student Performance Standards

Program Title: **Medical Quality Systems**
CIP Number: **0641010105**
Program Length: **15 credit hours**
SOC Code(s): **29-2071, 31-9092, 29-2012, 51-9082, 11-9111, 17-2031, 19-4021**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of the Food and Drug Administration (FDA) regulations and compliance for biomedical systems--The student will be able to:
01.01	Describe how the FDA is organized.
01.02	Locate the Code of Federal Regulations (C.F.R.) specific to the FDA regulations that apply to biomedical systems manufacturers.
01.03	Describe the role of the FDA's standing advisory committee, the Center for Devices and Radiological Health (CDRH).
01.04	Define medical devices, products, and systems and their federal classifications.
01.05	Explain the 510(k) Premarket Notification Process including Applications (PMA).
01.06	Explain an investigational device exemption (IDE).
01.07	Explain the differences between Class I, II, and III devices.
01.08	Describe and explain the Federal Food, Drug, and Cosmetic Act (FDCA).
01.09	Define and describe good laboratory and clinical practices.
01.10	Define and describe the quality system regulations (QSRs).
01.11	Define and describe Current Good Manufacturing Practices.
01.12	Define and describe foreign regulatory systems, i.e., the European Union (EU).
01.13	Identify and explain the components of ISO 13485/ISO 13488.
02.0	Demonstrate knowledge in the design and manufacture of biomedical systems–The student will be able to:
02.01	Describe uses for which products could be designed.
02.02	Apply the steps identified in the FDA's regulatory requirements 21 CFR 820.30 Design Control.
02.03	Describe the various product design methodologies and their associated lifecycles.
02.04	Define, describe, and list product specifications.
02.05	Describe, list, and apply failure modes and effects analysis (FMEA) to increase product safety.
02.06	Demonstrate how various components of the design and development process effect reliability.

	02.07	Describe concurrent product and process development.
	02.08	Describe and compare installation and operation qualifications.
	02.09	Recognize process optimization.
	02.10	Develop and analyze process flow maps.
	02.11	Differentiate between verification and validation.
	02.12	Describe and determine how a design requirement is verified.
	02.13	Describe and analyze how customer needs are validated.
	02.14	Describe how a process output can be verified.
	02.15	Describe and analyze process capability.
	02.16	Define the terms associated with production scale-up.
	02.17	Describe and analyze production scheduling.
	02.18	Describe a market release package with multiple components.
	02.19	Determine a root cause of a problem is determined.
03.0	Demonstrate knowledge of risk management for biomedical products development and production–The student will be able to:	
	03.01	Describe the FDA's definition of risk management.
	03.02	Explain how the subparts to the FDA's regulatory requirements 21 CFR 820 Quality System Regulation (QSR) relate to risk management.
	03.03	Explain the process of identifying the key risk management activities critical to a successful risk management process.
	03.04	Explain the components of ISO 14971 and how they provide effective management of the risks associated with the use of medical devices.
	03.05	Explain how the components of risk management identified in ISO 14971 relate to the FDA's Quality System Regulation (QSR).
	03.06	Develop a comprehensive risk management plan.
	03.07	Identify internal and external sources for determining product hazards.
	03.08	Estimate a risk using risk analysis tools and techniques.
	03.09	Evaluate a risk using risk evaluation tools and techniques.
	03.10	Identify the steps associated with risk control.
	03.11	Identify the risk elements that can be reduced to decrease the risk associated with a hazard.
	03.12	Describe the process of verification and explain its role in risk control.
	03.13	Explain the relationship between risk control measures and the introduction of new hazards.
	03.14	Explain the difference between residual risk and overall residual.
	03.15	Develop a risk management report.

	03.16	List and describe the elements of corrective action and preventive action (CAPA) associated with Post Production Information.
04.0	Demonstrate knowledge of quality audits for biomedical systems–The student will be able to:	
	04.01	Define terms associated with quality auditing.
	04.02	Describe the characteristics of internal and external quality audits.
	04.03	Describe the relationship between the quality audit and the FDA regulatory requirement 21 CFR 820.20 (c).
	04.04	List factors that can influence the credibility of quality audits.
	04.05	Describe the purpose and characteristics of a confidentiality agreement.
	04.06	Describe the auditor's responsibilities when illegal or unsafe conditions or activities are discovered during an audit.
	04.07	Identify sources in a medical device manufacturing organization that generate performance history data for review prior to performing a quality audit.
	04.08	Identify the quality auditing strategies for data collection.
	04.09	Describe the purpose and scope of the quality audit opening and closing meetings.
	04.10	Identify auditable quality records in a medical device manufacturing company as defined by the FDA regulatory requirements 21 CFR 820.180.
	04.11	Describe the relationship of risk and criticality in analyzing audit data.
	04.12	Describe the difference between compliance issues and effectiveness issues and giving examples of each.
	04.13	Describe record retention requirements.
	04.14	Identify effective communication techniques that can be successfully used in a quality audit.
	04.15	Conduct a simulated audit that conforms to FDA regulatory requirements.
	04.16	Write a comprehensive audit report.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program and include the proper use of computers, software, and specialized material related to quality manufacturing.

These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Chemical Laboratory Specialist**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0641030101
Program Type	College Credit Certificate (CCC)
Program Length	37 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4031 – Chemical Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Chemical Technology AS degree program Chemical Technology (1641030100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to development of chemical and other scientific skills. The program completer will be able to assist chemists, biochemists and chemical engineers by performing chemical, biological and physical laboratory tests for various purposes such as quality control monitoring of on-going production operations, research and development, and the maintenance of health and safety standards in the laboratory.

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

Standards

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

01.0 Demonstrate basic knowledge of chemical concepts
02.0 Demonstrate knowledge of chemical kinetics and thermodynamics.
03.0 Demonstrate skills in handling chemical materials and equipment.
04.0 Demonstrate conceptual and laboratory knowledge in the area of organic chemistry and/or physics and/or biology and/or engineering and/or biotechnology and/or chemical instrumentation.
05.0 Exercise safety in the laboratory and adhere to safety, health and environmental regulations.

Florida Department of Education
Student Performance Standards

Program Title: **Chemical Laboratory Specialist**
CIP Number: **0641030101**
Program Length: **37 credit hours**
SOC Code(s): **19-4031**

This certificate program is part of the Chemical Technology AS degree program Chemical Technology (1641030100). At the completion of this program, the student will be able to:	
01.0	Demonstrate basic knowledge of chemical concepts--The student will be able to:
01.01	Write chemical formulas and use correct chemical nomenclature for inorganic compounds.
01.02	Classify inorganic compounds according to a variety of chemical and physical properties.
01.03	Name and write the symbols for the elements and describe characteristics of the common groupings of elements.
01.04	Describe the basic reactions that occur between commonly used chemical substances.
01.05	Read, write, balance and interpret chemical equations.
01.06	Solve a variety of basic chemical problems using equations and/or dimensional analysis.
01.07	Classify chemicals according to reactivity.
01.08	Identify incompatible combinations of chemicals that could result in potentially dangerous situations.
01.09	Solve a variety of problems dealing with chemical composition and stoichiometry.
01.10	Know and apply empirical gas laws and theory relating to the behavior of gases.
01.11	Demonstrate a basic understanding of energy as it relates to chemical and other processes.
01.12	Demonstrate a basic understanding of the laws and theories relating to the structure of the atom and how this relates to the Periodic Table.
01.13	Demonstrate a basic understanding of molecular structure and chemical bonding,
01.14	Describe the structure and properties of liquids and solids.
01.15	Describe solutions and their properties, and perform calculations involving solution composition and colligative properties.
02.0	Demonstrate knowledge of chemical kinetics and thermodynamics--The student will be able to:
02.01	Demonstrate a basic understanding of chemical kinetics
02.02	Demonstrate a basic understanding of chemical equilibria.
02.03	Demonstrate a working knowledge of acid/base equilibria.
02.04	Demonstrate a working knowledge of precipitation equilibria,

	02.05	Demonstrate a working knowledge of redox chemistry.
	02.06	Use the concepts of heat, work, energy, enthalpy, entropy and Gibbs Free Energy to discuss how energetics and change are interrelated in chemical processes and solve related problems.
	02.07	Demonstrate a basic knowledge of radioactivity.
03.0	Demonstrate skills in handling chemical materials and equipment--The student will be able to:	
	03.01	Properly identify and use a variety of common chemistry laboratory glassware.
	03.02	Use common chemistry laboratory equipment to include such items as hot plates, stirrers, laboratory balances and centrifuges.
	03.03	Preparing solutions of specific concentration from pure substances.
	03.04	Performing dilutions to prepare solution of specific concentration.
	03.05	Purify chemicals using techniques such as filtering, extracting, crystallization, precipitation, distilling, etc.
	03.06	Use basic analytical chemistry procedures and concepts of measurements in volumetric, gravimetric, and electrochemical analyses and correctly perform associated calculations.
	03.07	Prepare samples for analysis, including digesting, ashing, dissolving, grinding, purifying, diluting, and chemically altering as appropriate before analysis.
	03.08	Determine pH using both wet and instrumental methods.
	03.09	Calculate molarity, molality, mole fraction, weight percent, and normality of solutions, given the appropriate information.
	03.10	Conduct analytical tests using acid-base, oxidation-reduction, and complexometric titrations.
	03.11	Perform gravimetric, volumetric, and electrochemical analyses and achieve results within acceptable limits of precision and accuracy.
	03.12	Apply statistical methods of data treatment.
04.0	Demonstrate conceptual and laboratory knowledge in the area of organic chemistry and/or analytical chemistry and/or physics and/or biology and/or engineering and/or biotechnology and/or chemical instrumentation--Students will be competent in two or more of the following areas of specialization:	
Specialty I: Organic Chemistry--The student will be able to:		
	04.01	Draw Lewis structures, deduce atomic orbital hybridizations and describe molecular shapes for organic structures.
	04.02	Classify organic reactions in common groups, write chemical equations and describe unique features for each type.
	04.03	Describe, name, and give common reactions of alkanes, alkenes, and alkynes.
	04.04	Describe, name, and give common reactions of alcohols, ethers, and halides.
	04.05	Describe, name, and give common reactions of aldehydes and ketones.
	04.06	Describe, name, and give common reactions of carboxylic acids and esters.
	04.07	Describe, name, and give common reactions of amines and amides.
	04.08	Describe and name simple carbohydrates, simple lipids, and amino acids.

04.09	Describe the basic concepts of proteins and their structure.
04.10	Describe the basic concepts of polymerization reactions.
04.11	Apply concepts of chemical reactivity, kinetics, stoichiometry, and equilibrium to chemical syntheses and analyses.
04.12	Crystallize, evaporate, sublime, extract, and use phase separations and/or other purification and separation techniques.
04.13	Perform organic chemical reactions using glassware and techniques typically employed in organic chemistry laboratories (e.g. 'quick fir glassware, anhydrous conditions etc.)
04.14	Determine reaction yields using chemical stoichiometry.
04.15	Use chemical and instrumental techniques to determine the structure of organic materials.
Specialty II: Physics--The student will be able to:	
04.16	Solve physical problems dealing with mass, distance, area, volume, relative position, motion, velocity, kinetic and potential energy, momentum, force, acceleration, heat, sound and related concepts.
04.17	Use analytical reasoning in solving problems dealing with a variety of physical quantities and phenomena.
04.18	Use basic concepts and terminology from physics and related applications as found in the industrial workplace.
04.19	Use basic laboratory instruments for determining length, mass, time, temperature and other easily measurable physical quantities.
04.20	Collect and manipulate numerical data in controlled experiments involving physical parameters and use these data to discover the mathematical functions by which the variables are related.
04.21	Analyze physical behavior and know how to properly apply principles of physics related to basic mechanics and sound.
04.22	Characterize physical properties of gases, liquids, and solids and describe their reactions to changes of temperature and pressure.
04.23	Choose the appropriate equipment for measuring physical properties based on specified accuracy and precision requirements.
04.24	Solve physical problems dealing with basic concepts in electricity, magnetism, light, optics and thermodynamics.
04.25	Analyze physical behavior and know how to properly apply principles of physics related to basic electricity, magnetism, light, optics and thermodynamics.
Specialty III: Biology--The student will be able to:	
04.26	Name the components of the cell theory and relate each to basic concepts of life.
04.27	Given a list of structural characteristics and components, relate them to the correct cell structure. Given a list of cellular activities or characteristics, relate them to the correct cell structure.
04.28	Explain and interpret the role of mutations, natural selection and its basic components as they relate to biological evolution.
04.29	Know why energy is limited in amount. Know and be able to explain the consequences of energy in terms of its availability to living organisms, both now and in the future. Know how it is used and transferred through food chains.
04.30	Explain how sunlight is trapped as an energy source and how this trapped energy is used to synthesize simple organic molecules. Describe the basic role or activity of chloroplasts and chlorophyll, cyclic and non-cyclic photophosphorylation, carbon dioxide reduction and fixation.

04.31	Describe the sequential events of mitosis.
04.32	Describe the sequential events of meiosis.
04.33	Solve and interpret various genetics problems involving Mendelian principles.
04.34	List and describe ways and give examples of how man has altered his environment, both positively and negatively, and be able to detail some of the consequences of this action.
04.35	Give the basic characteristics of the carbon, nitrogen, and hydrological cycles.
04.36	Describe the effects of the increasing human population upon natural resources use and depletion, degradation of the environment, social and economic problems both within nations and between nations, etc.
04.37	State the basic morphologic types of Eubacteria.
04.38	Diagram and describe the structural components of bacterial cells.
04.39	Distinguish gram positive cells and gram negative cells from a description of cell wall chemical components.
04.40	Successfully demonstrate the correct staining procedure for general staining, acidfast staining, spore staining, capsular staining and flagellar staining.
04.41	Describe the characteristics that identify by form yeasts, rickettsias, PPLs, viruses and molds, and show how they are distinguished from other organisms or types of bacteria.
04.42	List the factors determining colonial growth.
Specialty IV: Engineering--The student will be able to:	
04.43	Utilize vectors to solve engineering problems.
04.44	Utilize calculus to solve engineering problems.
04.45	Analyze particles and rigid bodies in equilibrium.
04.46	Analyze situations where a force causes a rigid body to rotate.
04.47	Characterize the static and rotational properties of irregular shaped rigid bodies.
04.48	Analyze the distribution of forces and moments within a structural member.
04.49	Analyze the equilibrium of rigid bodies subjected to dry friction.
04.50	Analyze the motion of particles.
04.51	Analyze the kinetics of particles using Newton's Second Law, the methods of work and energy and the methods of impulse and momentum.
04.52	Analyze the kinetics of a system of particles.
04.53	Analyze the motion of rigid bodies.
04.54	Analyze the effect of forces on rigid bodies in two dimensions.
04.55	Analyze the kinetics of rigid bodies using the methods of work, energy, impulse, and momentum in two dimensions.
04.56	Produce accurate diagrams of two and three dimensional objects using a design and drafting software package.

04.57	Solve mathematical problems using software packages such as Excel, MathCAD and MATLAB.
04.58	Acquire the team building skills typically found in the engineering profession.
Specialty V: Biotechnology--The student will be able to:	
04.59	Demonstrate an understanding of the operating principle, safety features and uses of the following equipment used in a biotechnology laboratory.
04.60	Demonstrate an understanding the importance of a sterile working environment and proper aseptic techniques for culturing bacterial.
04.61	Demonstrate an understanding of the operating principle, safety features and use of common bioseparation techniques.
04.62	Demonstrate an understanding of the methodologies required for creating recombinant DNA encompassing.
04.63	Demonstrate an understanding of the science and scientific basis of biotechnology including traditional methodologies, fermentation and industrial microbiology.
04.64	Demonstrate a basic understanding of the concept of bioethics, safety concerns of bioengineered products and the licensing and patenting process for biotechnology products.
04.65	Implement proper aseptic techniques and disposal procedures for potentially biohazardous materials.
04.66	Operate equipment typically found in a biotechnology laboratory safely.
04.67	Prepare samples of RNA/DNA for microinjection as guided by Standard Operating Procedures, create transgenic organisms, and interpret effectiveness of technique
Specialty VI: Chemical Instrumentation--The student will be able to:	
04.68	Describe the basic scientific principles behind a variety of instrumental methods used in a modern chemical laboratory such as atomic spectroscopy, molecular spectroscopy, chromatography, and X-ray techniques.
04.69	Describe the major components of each instrumental method studied and the role that each component plays in making the chemical measurement.
04.70	Gain hands-on experience in the operation of instruments locally available.
04.71	Gain experience in the application of each instrumental method to the solution of specific kinds of chemical analysis problems encountered in the industrial laboratory.
04.72	Choose an instrument appropriate for a given analysis and know the limitations of the instrument.
04.73	Properly prepare samples and properly calibrate each instrument.
04.74	Use proper safety precautions for all instruments.
04.75	Adjust instrument settings to handle varied chemical samples under a variety of conditions.
04.76	Describe the basic concepts of chemical/physical separation techniques and apply separation techniques to the analysis of materials.
04.77	Choose appropriate sample preparation techniques for physical characterization measurements and/or analysis of structure, concentration, and composition.

	04.78	Interpret and use schematic and/or electronic diagrams and drawings describing instruments.
	04.79	Apply basic knowledge of organic and inorganic chemistry, including nomenclature, classification in chemical groups, chemical and physical characteristics and chemical reactivity to instrumental analysis.
05.0	Exercise safety in the laboratory and adhere to safety, health and environmental regulations--The student will be able to:	
	05.01	Be aware of and follow federal, state, and local legislation pertaining to safety, health, and environmental regulations.
	05.02	Recognize that each company has policies and safety plans that include evacuation procedures, emergency numbers, rules, and practices.
	05.03	Demonstrate familiarity with "Right to Know" legislation and how it applies to chemical laboratory technicians.
	05.04	Recognize, apply, and respond appropriately to the hazard symbols and toxicology sections of MSDSs.
	05.05	Choose the proper safety equipment for conducting a variety of laboratory tasks (e.g., proper hoods, shields).
	05.06	Choose and demonstrate the use of personal protective equipment to be used in a variety of situations (e.g., eye wear, special clothing).
	05.07	Demonstrate safe handling procedures (e.g., handling cylinders, glassware, laboratory instruments)
	05.08	Describe the various categories of hazardous materials.
	05.09	State the considerations which must be examined when storing chemicals.
	05.10	Make informed and appropriate decisions on how and where to store chemical materials to minimize hazards.
	05.11	Given a material safety data sheet, explain each section of the sheet.
	05.12	Define and give an example of the major physical and health hazards which are likely to be encountered in the industrial laboratory.
	05.13	List the information needed on each hazardous material when conducting an inventory.
	05.14	Demonstrate the human health effects associated with exposure to hazardous materials.
	05.15	Exercise appropriate precautions in handling hazardous chemicals, contaminated materials, hot objects, sharp objects, etc.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Scientific Workplace Preparation**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0641030102
Program Type	College Credit Certificate (CCC)
Program Length	26 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4031 – Chemical Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Chemical Technology AS degree program Chemical Technology (1641030100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to development of communication skills, mathematical skills, computer skills, a basic knowledge of scientific concepts in addition to modeling ethical responsibility. The program completer will be able to assist scientist by performing basic scientific laboratory tests for various purposes such as quality control monitoring of on-going production operations, research and development, and the maintenance of health and safety standards in the laboratory.

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

Standards

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

01.0 Demonstrate appropriate written and oral communication skills.
02.0 Demonstrate appropriate mathematical skills to solve basic problems in the sciences.
03.0 Demonstrate appropriate interpersonal skills, decision-making strategies, and awareness of self-worth, ethics and values.
04.0 Demonstrate computer competence.
05.0 Demonstrate basic knowledge of scientific concepts.
06.0 Demonstrate basic knowledge of chemical concepts.

Florida Department of Education
Student Performance Standards

Program Title: **Scientific Workplace Preparation**
CIP Number: **0641030102**
Program Length: **26 credit hours**
SOC Code(s): **19-4031**

This certificate program is part of the Chemical Technology AS degree program Chemical Technology (1641030100). At the completion of this program, the student will be able to:	
01.0	Demonstrate appropriate communication skills--The student will be able to:
01.01	Write logical and understandable sentences and paragraphs.
01.02	Carefully read, accurately follow, and demonstrate understanding of written instructions and procedures.
01.03	Read critically by recognizing assumptions and implications and by evaluating ideas.
01.04	Carefully follow and deliver oral instructions and other spoken information related to the workplace.
01.05	Prepare, outline, and deliver a short oral presentation.
01.06	Participate in group discussion as a member and as a leader.
01.07	Prepare visual material to support an oral presentation.
01.08	Answer and ask questions coherently and concisely.
01.09	Give clear, concise instructions.
01.10	Read technical manuals, reports and journals.
01.11	Read and prepare diagrams and charts.
01.12	Maintain logs and notes.
01.13	Keep records
01.14	Maintain an accurate notebook.
01.15	Report data.
01.16	Write methods.
01.17	Write memos and letters.
02.0	Demonstrate appropriate mathematical skills to solve basic problems in the sciences--The student will be able to:
02.01	Calculate ratios.
02.02	Perform unit conversions.

	02.03 Perform calculations using exponents and exponential functions.
	02.04 Perform calculations using logarithms and logarithmic functions.
	02.05 Use appropriate significant figures.
	02.06 Recognize patterns from data.
	02.07 Solve single-unknown algebraic equations.
	02.08 Read and construct graphs.
	02.09 Calculate slopes and intercepts of linear graphs.
	02.10 Perform calculations using roots.
	02.11 Solve simultaneous equations.
	02.12 Solve quadratic equations.
	02.13 Solve chemical and other word problems using arithmetic and algebra.
03.0	Demonstrate appropriate interpersonal skills, decision-making strategies, and awareness of self-worth, ethics and values--The student will be able to:
	03.01 Discuss the importance of teamwork and have experience working as a member of a team for planning, performing, analyzing, and reporting.
	03.02 Demonstrate critical thinking skills.
	03.03 Demonstrate high ethical standards in all aspects of work.
	03.04 Apply quality principles to all aspects of work.
	03.05 Develop appropriate interpersonal skills.
	03.06 Recognize sources and symptoms of stress and learn how to manage one's response to it.
	03.07 Demonstrate the ability to compete effectively in the job market.
	03.08 Determine the importance of initiative and responsibility and examine the possible repercussions of action vs. non-action.
	03.09 Demonstrate the ability to problem solve effectively and resolve typical workplace conflicts.
	03.10 Apply decision-making strategies to workplace situations.
	03.11 Explain the basis for employer expectations: the written and unwritten "rules for success."
	03.12 Interpret the meaning of loyalty and commitment to the organization.
	03.13 Recognize the "culture" of an organization or employer and evaluate its impact on the individual.
	03.14 Develop an awareness of diversity and multi-culturalism.
04.0	Demonstrate computer competence--The student will be able to:
	04.01 Use a computer keyboard.
	04.02 Discuss fundamental computer and networking concepts.

04.03	Use word processing software.
04.04	Use graphics software.
04.05	Access database information.
04.06	Maintain a database.
04.07	Use, maintain, and develop spreadsheets.
04.08	Use statistical software.
05.0	Demonstrate basic knowledge of scientific concepts--The student will be able to:
05.01	Discuss the scientific method.
05.02	Understand the need to organize and classify natural phenomena.
05.03	Discuss relationships between characteristics of natural phenomena.
05.04	Dissect a natural system into its component parts
05.05	Model natural phenomena.
05.06	Understand that nature behaves in predictable ways.
05.07	Discuss methods of observing natural changes, from extremely slow changes to extremely fast changes.
05.08	Discuss the variation in the scale of naturally occurring phenomena
05.09	Discuss the diversity found within classes of natural organisms
06.0	Demonstrate basic knowledge of chemical concepts--The student will be able to:
06.01	Write chemical formulas and use correct chemical nomenclature for inorganic compounds.
06.02	Classify inorganic compounds according to a variety of chemical and physical properties.
06.03	Name and write the symbols for the elements and describe characteristics of the common groupings of elements.
06.04	Describe the basic reactions that occur between commonly used chemical substances.
06.05	Read, write, balance and interpret chemical equations.
06.06	Solve a variety of basic chemical problems using equations and/or dimensional analysis.
06.07	Classify chemicals according to reactivity.
06.08	Identify incompatible combinations of chemicals that could result in potentially dangerous situations.
06.09	Solve a variety of problems dealing with chemical composition and stoichiometry.
06.10	Know and apply empirical gas laws and theory relating to the behavior of gases.
06.11	Demonstrate a basic understanding of energy as it relates to chemical and other processes.
06.12	Demonstrate a basic understanding of the laws and theories relating to the structure of the atom and how this relates to the Periodic Table.
06.13	Demonstrate a basic understanding of molecular structure and chemical bonding,

06.14 Describe the structure and properties of liquids and solids.
06.15 Describe solutions and their properties, and perform calculations involving solution composition and colligative properties.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Microcomputer Repairer/Installer**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0647010406
Program Type	College Credit Certificate (CCC)
Program Length	15 credit hours
CTSO	Phi Beta Lambda, BPA (Business Professionals of America)
SOC Codes (all applicable)	15-1151 – Computer User Support Specialists
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Computer Engineering Technology AS degree program (1615120100).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the Manufacturing 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 Manufacturing career cluster.

The content includes but is not limited to the study of computer systems architecture.

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

Standards

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

01.0 Demonstrate proficiency in microcomputers and computer systems architecture.
02.0 Understand, install, configure and troubleshoot issues relating to computer hardware and software.
03.0 Demonstrate proficiency in direct current circuits and network analysis.
04.0 Demonstrate proficiency in alternating current circuits and network analysis.
05.0 Demonstrate proficiency in analog electronics.
06.0 Demonstrate proficiency in digital electronics.

Florida Department of Education
Student Performance Standards

Program Title: **Microcomputer Repairer/Installer**
CIP Number: **0647010406**
Program Length: **15 credit hours**
SOC Code(s): **15-1151**

This certificate program is part of the Computer Engineering Technology AS degree program (1615120100). At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in microcomputers and computer systems architecture--The student will be able to:
01.01	Draw the block diagram and describing the basic architecture of a microcomputer.
01.02	Identify and give functional descriptions of data, address, and control buses.
01.03	Identify and define priorities and interrupts at system level.
01.04	Define and list direct memory access handling systems.
01.05	Define functions of advanced memory techniques (e.g. virtual, pipeline, cache).
01.06	Identify the various types of RAM and ROM memories and their interfacing to the microprocessor/microcontroller.
02.0	Understand, install, configure and troubleshoot issues relating to computer hardware and software--The student will be able to:
02.01	Understand, identify, and define basic operating system concepts such as paging, memory management, process synchronization and management, basic operating system structures, threads, single and multi-user systems, and protection/security.
02.02	Describe the functions and major components (BIOS, task management, etc.) of a computer operating system.
02.03	Use an operating system for activities such as data and file management.
02.04	Identify various coding schemes (ASCII, etc.).
02.05	Identify the major hardware platforms.
02.06	Set up and use multiple hardware platforms built on various processor architectures.
02.07	Use system software to perform routine maintenance tasks such as backup, hard drive defragmentation, etc.
02.08	Use both stand-alone operating systems and network operating systems.
02.09	Describe and demonstrate the primary features and functions of the major categories of applications software (word processing, database, spreadsheet, presentation, email, browsers, etc.).
02.10	Describe the functions of major components of a computer system.
02.11	Discuss various computer applications in society.
02.12	Describe the categories of computers.

	02.13 Recognize the value of computer literacy within an individual's personal and career environments.
	02.14 Set up and configure systems and peripherals.
	02.15 Set up and upgrade BIOS.
	02.16 Install and configure storage and I/O device interfaces.
	02.17 Describe the architecture of a typical microcomputer system.
	02.18 Perform component maintenance tasks on microcomputer systems.
	02.19 Perform preventive maintenance tasks on microcomputer systems.
	02.20 Describe issues that affect system design and construction (redundancy, fault tolerance, etc.).
03.0	Demonstrate proficiency in direct current circuits and network analysis–The student will be able to:
	03.01 Solve problems in electronic units utilizing metric prefixes.
	03.02 Relate electricity to the nature of matter.
	03.03 Identify sources of electricity.
	03.04 Define voltage, current, resistance, power and energy.
	03.05 Read and interpret color codes and symbols to identify electrical components and values.
	03.06 Measure properties of a circuit using digital multimeter (DMM) and oscilloscopes.
	03.07 Construct and verify operation of series circuits.
04.0	Demonstrate proficiency in alternating current circuits and network analysis–The student will be able to:
	04.01 Identify properties of an AC signal.
	04.02 Identify AC sources.
	04.03 Analyze and measure AC signals utilizing VOM, DVM, oscilloscope, frequency counter and function generator.
05.0	Demonstrate proficiency in analog electronics–The student will be able to:
	05.01 Construct, analyze, and troubleshoot diode circuits.
	05.02 Construct, analyze, and troubleshoot bipolar junction transistor biased circuits.
	05.03 Construct, analyze, and troubleshoot multistage amplifiers.
	05.04 Construct power supply regulator circuits.
	05.05 Construct active filter circuits.
	05.06 Construct oscillator circuits.
06.0	Demonstrate proficiency in digital electronics–The student will be able to:
	06.01 Construct combinational logic circuits using integrated circuits.
	06.02 Troubleshoot logic circuits.

06.03 Construct digital display circuits.
06.04 Demonstrate proficiency in the use of function generators and oscilloscopes for digital circuits.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

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Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Composite Fabrication and Testing**
Specialization Tract: **Advanced Manufacturing**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0647061608
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours (Primary), 19 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	51-2091 – Fiberglass Laminators and Fabricators
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to specialized courses in Applied Technology areas for design, assembly, and fabrication using composite materials.

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

Standards

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

01.0 Demonstrate an understanding of safety, health, and environmental requirements.
02.0 Demonstrate proficiency in using tools, instruments and testing devices.
03.0 Demonstrate basic troubleshooting skills.
04.0 Demonstrate proficiency in composite fundamentals.

Florida Department of Education
Student Performance Standards

Program Title: **Composite Fabrication and Testing**
CIP Number: **0647061608**
Program Length: **12 credit hours**
SOC Code(s): **51-2091**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Demonstrate an understanding of safety, health, and environmental requirements--The student will be able to:
01.01	Communicate any new or revised safety procedures.
01.02	Update personnel about current safety guidelines.
01.03	Wear appropriate Personal Protective Equipment (PPE).
01.04	Follow area-posted safety guidelines.
01.05	Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA).
01.06	Maintain a clean and safe work environment.
01.07	Maintain personal protection equipment.
01.08	Report unsafe conditions/practices.
01.09	Locate emergency exits and alarms.
01.10	Comply with company-established safety practices.
01.11	Use appropriate fire fighting procedures.
01.12	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
01.13	Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
01.14	Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
01.15	Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
01.16	Demonstrate knowledge of incident reporting procedures.
01.17	Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
01.18	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
01.19	Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.

02.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:
02.01	Identify and use hand tools properly.
02.02	Identify and use power tools properly.
02.03	Use inspection equipment appropriately.
02.04	Implement appropriate testing regimes.
02.05	Use appropriate measurement tools (e.g., micrometers, tapes. etc).
02.06	Use appropriate safety monitoring and testing equipment.
02.07	Communicate issues with hand sketches.
02.08	Use electronic measuring equipment and instruments.
02.09	Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
03.0	Demonstrate basic troubleshooting skills--The student will be able to:
03.01	Apply troubleshooting and critical thinking skills to define the problem.
03.02	Identify symptoms and changes in a system.
03.03	Isolate potential sources/causes of problems.
03.04	Consult reference materials.
03.05	Evaluate repair options.
03.06	Document properly all repairs and adjustments made.
03.07	Monitor and correct parameters during tests.
03.08	Estimate and forecast time and resources needed to perform task.
03.09	Read blueprints, schematics and technical drawings.
03.10	Modify or adjust equipment per engineering specifications.
03.11	Analyze process to identify and correct problems, such as bottlenecks.
04.0	Demonstrate proficiency in composite fundamentals--The student will be able to:
04.01	Identify and characterize composite materials and commodities.
04.02	Identify uses and hazards involved in handling common composite supplies.
04.03	Explain how properties of materials determine their classification and use.
04.04	Identify symptoms/causes of delaminating.
04.05	Identify symptoms and causes of faulty bonds.
04.06	Demonstrate knowledge of handling composite materials, adhesives, solvents, etc.
04.07	Identify tools used in composite fabrication and repair.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program and include the proper use of test equipment, such as a Digital multimeter, measurement devices, some hand and small power tools, composite fabrication and design equipment, as well as various chemicals including resins, laminates and solvents. Special emphasis is placed on the safe handling of equipment and chemicals used in the composite industry.

These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **CNC Machinist/Fabricator**
Specialization Tract: **Mechanical Design and Fabrication**
Career Cluster: **Manufacturing**

CCC	
CIP Number	0648051002
Program Type	College Credit Certificate (CCC)
Program Length	12 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This certificate program is part of the Engineering Technology AS degree program (1615000001).

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to maintenance techniques, computer aided drafting/design skills, technical communications, maintenance and operation of various industrial components, quality control and testing, material handling protocols, and proper usage of tools and instrumentation.

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

Standards

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

01.0 Generate and interpret computer-aided drawings.
02.0 Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods.
03.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
04.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.

Florida Department of Education
Student Performance Standards

Program Title: **CNC Machinist/Fabricator**
CIP Number: **0648051002**
Program Length: **12 credit hours**
SOC Code(s): **51-4012**

This certificate program is part of the Engineering Technology AS degree program (1615000001). At the completion of this program, the student will be able to:	
01.0	Generate and interpret computer-aided drawings--The student will be able to:
01.01	Apply current industrial computer aided-drawing practices.
01.02	Construct geometric figures.
01.03	Create and edit text formatted to industry standards.
01.04	Use and control accuracy-enhancement tools for entity-positioning methods.
01.05	Identify, create, store, and use standard part symbols and libraries.
01.06	Control entity properties by layer, color, and line type.
01.07	Use viewing commands to perform zooming and panning.
01.08	Use Query commands to interrogate database for entity characteristics.
01.09	Plot drawings on media using layout and scale.
01.10	Prepare drawings for flexibility of future editing and minimum file size.
01.11	Apply standard dimensioning rules.
01.12	Demonstrate proficiency importing and exporting various files types.
01.13	Operate related peripheral devices.
01.14	Read and interpret technical drawings to assure conformity of product.
01.15	Demonstrate skill in assessing and reading schematics and drawings.
02.0	Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods--The student will be able to:
02.01	Demonstrate professionalism in the manufacturing environment.
02.02	Comprehend, use and work with precision numbers.
02.03	Interpret mechanical drawings.
02.04	Demonstrate the use of geometric dimensioning and tolerancing.

02.05	Choose appropriate materials for machining processes.
02.06	Demonstrate safe use of hand and power tools.
02.07	Identify the use and process in part layout.
02.08	Demonstrate a working knowledge of metal forming equipment.
02.09	Demonstrate the use of precision steel rulers.
02.10	Demonstrate the use of oxy-acetylene welding.
02.11	Demonstrate acceptable methods in tungsten inert gas welding.
02.12	Demonstrate acceptable methods in gas metal arc welding.
02.13	Demonstrate acceptable methods to use a dial indicator.
02.14	Explain the use of a height gauge to measure stock.
02.15	Demonstrate proper use of sheet metal tools.
02.16	Demonstrate acceptable methods hand cutting and forming sheet metal.
02.17	Demonstrate the use of layout sheet metal tools.
02.18	Demonstrate acceptable methods using micro-counter sinks.
02.19	Demonstrate acceptable methods of Riveting solid rivets.
02.20	Identify and demonstrate operation of the pneumatic rivet gun.
02.21	Demonstrate the use of a rivet gauge set.
02.22	Demonstrate acceptable methods using a back rivet set.
02.23	Demonstrate acceptable methods using bucking bars.
02.24	Demonstrate the use of rivet squeezers and dimpling.
02.25	Demonstrate acceptable methods in using a blind riveting.
02.26	Identify the axes on a CNC mill.
02.27	Demonstrate hand jog features on a CNC mill and CNC lathe.
02.28	Demonstrate acceptable methods to use an ironworker.
02.29	Demonstrate acceptable methods using a break & shear.
02.30	Demonstrate the use of precision measuring tools.
03.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:
03.01	Set up and maintain a manual and/or CNC machining centers.
03.02	Demonstrate processes using manual and/or CNC machining centers.
03.03	Demonstrate acceptable control of machining processes.

03.04	Identify and define chip formation, load and material removal rates.
03.05	Demonstrate the characteristics of machining cutting tools.
03.06	Identify or define cutting tool geometry and cutting tool materials to select tools for CNC machining.
03.07	Demonstrate efficient CNC machining processes.
03.08	Demonstrate the process to drill and layout holes to a specific size.
03.09	Identify part layout techniques.
03.10	Demonstrate machining procedures used in CNC programming.
03.11	Identify grinding machining practices and processes.
03.12	Demonstrate threading and tapping processes.
03.13	Identify metal alloys and their properties in machining.
03.14	Demonstrate job planning procedures in machining.
03.15	Calculate cutting tool speeds and feeds.
03.16	Adjust RPM of machining equipment.
03.17	Identify coordinate and primary machining axes.
03.18	Define and describe absolute and incremental coordinates.
03.19	Identify the five basic CNC drive components.
03.20	Demonstrate rapid travel and interpolation.
03.21	Identify coordinate and primary machining axes.
03.22	Identify and define manual and CNC machining operations.
03.23	Read and edit CNC programs.
03.24	Demonstrate acceptable procedures in starting CNC machines.
03.25	Demonstrate the CNC machine controls for set up and operation.
03.26	Demonstrate acceptable procedures to set up a CNC Machining center.
03.27	Demonstrate acceptable procedures to run programs using a CNC machining center.
03.28	Demonstrate acceptable procedures to generate a CNC program.
03.29	Demonstrate acceptable procedures in CNC job planning.
03.30	Select cutting tools, collets and holding fixtures.
03.31	Identify CNC tooling and applications.
03.32	Define CNC programming code words and conventions.
03.33	Define and demonstrate CNC program fixed cycles.

	03.34 Demonstrate use of CAD/CAM software and processes.
	03.35 Produce student generated projects.
04.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software–The student will be able to:
	04.01 Create CAD/CAM geometry for tool path processing.
	04.02 Demonstrate procedures to import/export CAD/CAM files.
	04.03 Demonstrate contouring using CAM tool path commands.
	04.04 Apply pocketing using CAM tool path commands.
	04.05 Demonstrate drill cycles using CAM tool path commands.
	04.06 Demonstrate thread cycles using CAM tool path commands.
	04.07 Demonstrate engraving using CAM tool path commands.
	04.08 Construct lettering using CAM tool path commands.
	04.09 Demonstrate nesting using CAM tool path commands.
	04.10 Describe procedures for CAM post-processing.
	04.11 Apply tool path verification for a CAM program.
	04.12 Demonstrate tool-path operations using CAM software.
	04.13 Demonstrate ability to save, copy, delete, and rename computer files.
	04.14 Create a CAD/CAM working portfolio.
	04.15 Demonstrate the use of back plotting in a cam program.
	04.16 Demonstrate how to modify an existing tool path.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615000001
Program Type	College Credit
Standard Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-9111 – Medical and Health Services Managers 17-2031 – Biomedical Engineers 17-2051 – Civil Engineers 17-3012 – Electrical and Electronics Drafters 17-3013 – Mechanical Drafters 17-3019 – Drafters, All Other 17-3023 – Electrical and Electronic Engineering Technicians 17-3024 – Electro-Mechanical Technicians 17-3026 – Industrial Engineering Technicians 17-3027 – Mechanical Engineering Technicians 17-3029 – Engineering Technicians, Except Drafters, All Other 19-4021 – Biological Technicians 27-1029 – Designers, All Other 29-2012 – Medical and Clinical Laboratory Technicians 29-2071 – Medical Records and Health Information Technicians 31-9092 – Medical Assistants 51-4012 – Computer Numerically Controlled Machine Tool Programmers, Metal and Plastic 51-4061 – Model Makers, Metal and Plastic 51-9082 – Medical Appliance Technicians 13-1199 – Business Operations Specialists 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 49-9041 – Industrial Machinery Mechanics
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, technical competency, safe and efficient work practices and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance and support for engineering design, processes, production, testing, and/or maintaining product quality.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Engineering Technology and Industrial Applications: production materials and processes, quality, computer-aided drafting, electronics, mechanics, instrumentation and safety.

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 eight specializations with one common core. It is recommended that students complete the core or demonstrate a mastery of the student performance standards contained in the core before advancing to the course(s) in the next level of specialization. The common core consists of 18 credit hours of technical core courses from the following areas: instrumentation and measurement, manufacturing processes and materials, quality, computer-aided drafting, electronics, and safety. The total Associate in Science degree program consists of 60 credit hours.

The 18 credit hour technical core has been defined to align with the Manufacturing Skills Standards Council's (MSSC) skills standards. MSSC skill standards define the knowledge, skills, and performance needed by today's frontline manufacturing workers. After completing this core and the General Education requirements, it is anticipated that students will be prepared to pass the MSSC Production Technician Certification.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is 60 credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate an understanding of industrial processes and material properties.
02.0 Generate and interpret computer-aided drawings.
03.0 Demonstrate a fundamental understanding of electronics and electricity.
04.0 Demonstrate an understanding of industrial safety, health, and environmental requirements.
05.0 Demonstrate proficiently in the use of quality assurance methods and quality control concepts.
06.0 Demonstrate proficiency in using tools, instruments and testing devices.
07.0 Demonstrate basic troubleshooting skills.
08.0 Demonstrate appropriate communication skills.
09.0 Demonstrate appropriate math skills.
10.0 Demonstrate an understanding of modern business practices and strategies.
11.0 Demonstrate employability skills.

In addition, students will complete the objectives in one of the following specializations:

Specialization Tract	SOC Code	Page Number
Advanced Manufacturing	17-3027	10
Quality	17-3026	14
Mechanical Design and Fabrication	51-4012	19
Electronics	17-3023	25
Advanced Technology	17-3029	31
Alternative Energy	17-3023	34
Biomedical Systems	19-4021	38
Digital Design and Modeling	17-3026	42
Digital Manufacturing	51-4061	46
Industrial Energy Efficiency	13-1199	53

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
CIP Numbers: **1615000001**
Program Length: **60 credit hours**
SOC Code(s): **17-3023, 17-3026, 17-3027, 17-3029, 51-4012**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate knowledge of industrial processes and materials properties--The student will be able to:
01.01	Demonstrate knowledge of current manufacturing processes.
01.02	Demonstrate knowledge of the use of current manufacturing machines, operating systems and mechanisms.
01.03	Estimate manpower needs and skills needed in assembly operations.
01.04	Demonstrate knowledge of the criteria for tool design, maintenance, procurement and handling.
01.05	Demonstrate knowledge of gage design, usage and limitations.
01.06	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for automated systems.
01.07	Demonstrate knowledge of processes used to ensure that changes do not negatively impact production or product.
01.08	Demonstrate knowledge of production timing to ensure customer satisfaction and on-time delivery.
01.09	Demonstrate knowledge of time and motion to enhance productivity.
01.10	Make continuous adjustments to equipment and procedures that result in improved productivity.
01.11	Demonstrate knowledge of how raw materials are moved.
01.12	Setup or modify new equipment per engineering specifications and documentations.
01.13	Demonstrate an understanding of the importance and impact of routine maintenance of machines and equipment on operations.
02.0	Generate and interpret computer-aided drawings--The student will be able to:
02.01	Apply current industrial computer aided-drawing practices.
02.02	Construct geometric figures.
02.03	Create and edit text formatted to industry standards.
02.04	Use and control accuracy-enhancement tools for entity-positioning methods.
02.05	Identify, create, store, and use standard part symbols and libraries.
02.06	Control entity properties by layer, color, and line type.

	02.07 Use viewing commands to perform zooming and panning.
	02.08 Use Query commands to interrogate database for entity characteristics.
	02.09 Plot drawings on media using layout and scale.
	02.10 Prepare drawings for flexibility of future editing and minimum file size.
	02.11 Apply standard dimensioning rules.
	02.12 Demonstrate proficiency importing and exporting various files types.
	02.13 Operate related peripheral devices.
	02.14 Read and interpret technical drawings to assure conformity of product.
	02.15 Demonstrate skill in assessing and reading schematics and drawings.
03.0	Demonstrate a fundamental understanding of electronics and electricity--The student will be able to:
	03.01 Use appropriate grounding techniques.
	03.02 Demonstrate knowledge of AC/DC theory.
	03.03 Solve circuit problems using unit conversion and scientific notation.
	03.04 Solve problems involving electric charge, electric current, potential difference, energy and Ohm's Law.
	03.05 Solve problems in electric circuits involving work and power.
	03.06 Solve problems involving series and parallel resistance circuits.
	03.07 Solve problems involving capacitance in DC circuits.
	03.08 Solve problems involving magnetic circuits.
	03.09 Solve problems involving inductance in DC circuits.
	03.10 Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
	03.11 Solve problems on factors governing reactance in AC circuits.
	03.12 Solve impedance problems in AC circuits.
	03.13 Prepare and complete concise, neat and accurate lab reports.
04.0	Demonstrate an understanding of safety, health, and environmental requirements--The student will be able to:
	04.01 Communicate any new or revised safety procedures.
	04.02 Update personnel about current safety guidelines.
	04.03 Wear appropriate Personal Protective Equipment (PPE).
	04.04 Follow area-posted safety guidelines.
	04.05 Demonstrate knowledge of, and follow applicable safety laws and regulations and the environment (e.g., Occupational Safety and Health Administration (OSHA).
	04.06 Maintain a clean and safe work environment.

	04.07	Maintain personal protection equipment.
	04.08	Report unsafe conditions/practices.
	04.09	Locate emergency exits and alarms.
	04.10	Comply with company-established safety practices.
	04.11	Use appropriate firefighting procedures.
	04.12	Apply Occupational Safety Health Administration (OSHA) safety standards properly.
	04.13	Demonstrate knowledge of when a machine or a process should be stopped to investigate or correct a hazard.
	04.14	Demonstrate knowledge of regulatory agency fines and requirement for corrective actions.
	04.15	Demonstrate knowledge of government and company procedures, rules and regulations concerning incident investigations.
	04.16	Demonstrate knowledge of incident reporting procedures.
	04.17	Use and evaluate information resources such as MSDS (Material Safety Data Sheets).
	04.18	Demonstrate knowledge of National Institute of Occupational Safety and Health (NIOSH), Environmental Protection Agency (EPA) and other regulatory agencies recommendations, guidelines and best practices.
	04.19	Demonstrate knowledge of how to safely identify, handle, monitor and measure hazardous materials.
05.0	Demonstrate proficiency in use of quality assurance methods, quality control concepts--The student will be able to:	
	05.01	Monitor processes for quality.
	05.02	Inspect product for quality.
	05.03	Document quality measurements or observations by filling out quality charts and records.
	05.04	Compare process measurements to standards.
	05.05	Identify root causes using standard techniques.
	05.06	Identify Corrective Action and Preventive Action.
	05.07	Describe the concept of quality assurance in increasing productivity and promoting zero defects.
	05.08	Apply data collection methods for productivity improvement and reporting.
	05.09	Analyze data using tools and techniques for productivity and quality problems.
	05.10	Analyze data using tools and techniques for cause and effect relationships.
	05.11	Develop and apply quality improvement strategies.
	05.12	Demonstrate an understanding of a quality process’s capability and its applications.
	05.13	Demonstrate knowledge of how to implement quality assurance principles and methods.
	05.14	Demonstrate knowledge of quality assurance checks for inspections.
	05.15	Demonstrate an understanding of internal and external supply chains.
	05.16	Demonstrate understanding of the configuration of management.

	05.17	Demonstrate knowledge of standard industry practices regarding inventory control methods and procedures.
	05.18	Demonstrate knowledge of production floor plan and safety requirements to place materials in most efficient and safe location and position.
	05.19	Demonstrate knowledge of storage space available to establish lot sizes and reorder points.
	05.20	Demonstrate knowledge of proper forecasts and methods for conducting inventory audits to recognize and report inventory discrepancies.
	05.21	Identify significant inventory discrepancies.
	05.22	Use cycle count process to ensure accurate counts are taken.
	05.23	Demonstrate knowledge of trade-off techniques (e.g., balance lead time and cycle time issues with inventory).
06.0	Demonstrate proficiency in using tools, instruments and testing devices--The student will be able to:	
	06.01	Identify and use hand tools properly.
	06.02	Identify and use power tools properly.
	06.03	Use inspection equipment appropriately.
	06.04	Implement appropriate testing regimes.
	06.05	Use appropriate measurement tools (e.g., micrometers, tapes. etc.).
	06.06	Use appropriate safety monitoring and testing equipment.
	06.07	Communicate issues with hand sketches.
	06.08	Use electronic measuring equipment and instruments.
	06.09	Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.
07.0	Demonstrate basic troubleshooting skills--The student will be able to:	
	07.01	Apply troubleshooting and critical thinking skills to define the problem.
	07.02	Identify symptoms and changes in a system.
	07.03	Isolate potential sources/causes of problems.
	07.04	Consult reference materials.
	07.05	Evaluate repair options.
	07.06	Document properly all repairs and adjustments made.
	07.07	Monitor and correct parameters during tests.
	07.08	Estimate and forecast time and resources needed to perform task.
	07.09	Read blueprints, schematics and technical drawings.
	07.10	Modify or adjust equipment per engineering specifications.
	07.11	Analyze process to identify and correct problems, such as bottlenecks.

08.0	Demonstrate appropriate communication skills--The student will be able to:
08.01	Write logical and understandable statements, or phrases, to accurately complete forms commonly used in business and industry.
08.02	Read and understand graphs, charts, diagrams, and common table formats.
08.03	Read and follow written instructions.
08.04	Demonstrate an understanding of; and ability to follow oral
08.05	Answer and ask questions coherently and concisely.
08.06	Read critically to identify oversights and assumptions.
08.07	Interact with co-workers using appropriate communication tools correctly.
08.08	Demonstrate knowledge of technical language and technical acronyms.
09.0	Demonstrate appropriate math skills--The student will be able to:
09.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
09.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
09.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
09.04	Use different unit systems appropriately.
09.05	Accurately convert between unit systems.
09.06	Read and interpret angle measurements.
09.07	Use scientific and engineering notation appropriately.
09.08	Apply the rules for significant digits properly.
09.09	Solve simple algebraic equations related to the workplace.
10.0	Demonstrate an understanding of modern business practices and strategies--The student will be able to:
10.01	Demonstrate knowledge of modern business practices.
10.02	Demonstrate knowledge of production process to meet business requirements.
10.03	Describe the importance of entrepreneurship to the American economy.
10.04	List the advantages and disadvantages of business ownership.
10.05	Identify the business skills needed to operate a small business efficiently and effectively.
10.06	Demonstrate knowledge of the alignment of a company’s business objectives with production goals.
11.0	Demonstrate employability skills--The student will be able to:
11.01	Demonstrate competence in job search and interview techniques.
11.02	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
11.03	Identify and practice acceptable work habits.

11.04	Demonstrate acceptable employee health habits.
11.05	Demonstrate knowledge of the "Right-To-Know Law".
11.06	Work effectively in teams.

Program Title: **Engineering Technology**
Specialization Tract: **Advanced Manufacturing**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as a Manufacturing Engineering Technician or Advanced Manufacturing or Production Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Understand, operate, troubleshoot, and maintain pneumatic, hydraulic, and electromechanical components and/or systems.
13.0 Identify and implement lean and six sigma concepts in manufacturing environments.
14.0 Operate industrial automation systems.
15.0 Troubleshoot industrial automation systems.
16.0 Apply the principles of robotics to automated systems.
17.0 Use proficiently human machine interfaces to operate automated systems
18.0 Identify, implement and/or interpret supply chain and operations management concepts and techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Advanced Manufacturing**

Standards	
12.0	Understand, operate, troubleshoot, and maintain pneumatic, hydraulic and electromechanical components and/or systems–The student will be able to:
12.01	Identify, classify and describe the function of pneumatic, hydraulic and electrical machines and components.
12.02	Construct flow diagrams of pneumatic, hydraulic, and electromechanical systems.
12.03	Perform basic operation maintenance of pneumatic, hydraulic and electromechanical components, devices and/or machines.
12.04	Understand maintenance requirements.
12.05	Troubleshoot errors, faults, and inconsistencies in pneumatic, hydraulic and electromechanical components, machines and/or systems.
12.06	Define special applications of electromechanical, hydraulic and pneumatic machines and devices used in processing sheet metal, metal cutting processing, plastics, food and beverages, injection molding, thermal molding and bulk processing equipment.
12.07	Describe important limitations of electromechanical, pneumatic and hydraulic machinery.
12.08	Operate independent pneumatic, hydraulic and electrical machines properly.
12.09	Describe the important operating parameters of pneumatic, hydraulic and electrical machines and/systems.
12.10	Identify and use appropriate monitoring gages for pneumatic, hydraulic, and electromechanical machines and/or systems.
12.11	Use safe practices while operating, troubleshooting and maintaining industrial equipment.
13.0	Identify and implement lean and six sigma concepts in manufacturing environments--The student will be able to:
13.01	Explain product manufacturing requirements.
13.02	Construct process flow charts.
13.03	Explain the role of management in production operations.
13.04	Integrate personnel, hardware, and software capabilities for timely completion of products and product orders.
13.05	Apply manufacturing resources planning and lean manufacturing principles to production and process planning.
13.06	Demonstrate good examples of lean manufacturing principles of kanban, synchronized flows, perfect first-time quality, waste minimization, continuous improvement, flexibility, and building long lasting relationships with suppliers and customers.
13.07	Implement minimization of wastes in the form of waiting time, inventory, processing, motion, over-production, transportation, and scrap.
13.08	Apply the 5S's: Sort, Set in Order, Shine, Standardize, and Sustain.

	13.09 Use six sigma tools to identify opportunities and drive improvements.
	13.10 Apply the PDCA (plan–do–check–adjust) method in improvement activities.
	13.11 Participate in a continuous process improvement event involving multiple disciplines.
14.0	Operate industrial automation systems--The student will be able to:
	14.01 Read and understand schematic diagrams.
	14.02 Chart and analyze ladder logic diagrams for industrial automation systems.
	14.03 Identify Programmable Logic Controller input and output module locations.
	14.04 Match wiring harness identification to program addresses for input and output modules.
	14.05 Identify active and passive states of each module.
	14.06 Interpret flow charts to match field device components with the real devices.
	14.07 Identify when a programmable controller is in run or program mode, or is in a fault condition.
	14.08 Integrate control systems and equipment with production and production support mechanisms.
	14.09 Establish routine operations involving maintenance schedules.
	14.10 Troubleshoot problems and perform minor repairs to industrial automation systems.
	14.11 Integrate control systems and equipment with production and production support mechanisms.
	14.12 Demonstrate automatic inventory accounting related monitoring and control systems.
	14.13 Implement automatic tracking of materials and products using bar codes, machine vision and sensing, and/or infrared technologies.
15.0	Troubleshoot industrial automation systems--The student will be able to:
	15.01 Demonstrate troubleshooting techniques to identify root cause, errors and faults of a problem.
	15.02 Isolate systems for troubleshooting.
	15.03 Develop a strategy for making system improvements based on troubleshooting activities with strong focus on fail-safing.
	15.04 Identify needed expertise to address the issue.
	15.05 Participate in troubleshooting and resolution teams effectively.
16.0	Apply the principles of robotics to automated systems--The student will be able to:
	16.01 Define the essential components of a robotic system.
	16.02 Choose appropriate robotic equipment for specific tasks.
	16.03 Describe methods of moving robotic parts.
	16.04 Choose and implement appropriate sensors for robotic applications.
	16.05 Choose and install appropriate actuators for robotic applications.
	16.06 Program robotic devices for restricted movements.

17.0	Use proficiently human machine interfaces to operate automated systems--The student will be able to:
17.01	Match computer graphic icons to real field equipment
17.02	Route data flow between computer and controlled machines.
17.03	Identify computer input and output signals and equipment destinations.
17.04	Implement manual override appropriately.
17.05	Perform computer based system and/or machine troubleshooting.
17.06	Define the essential components of an integrated HMI system.
18.0	Identify, implement, and/or interpret supply chain and operations management concepts and techniques--The student will be able to:
18.01	Use appropriate software for supply chain management strategies.
18.02	Illustrate how efficiency and effectiveness are necessary attributes of good operations management.
18.03	Apply simulations used for layout and design of production operations.
18.04	Apply engineering economy factors in equipment justification.
18.05	Calculate machinery utilization.
18.06	Demonstrate warehouse throughput systems.
18.07	Demonstrate basic principles and methods of controlling work in progress.
18.08	Follow raw materials from their source to distribution of the product.
18.09	Develop strategies to identify improvement opportunities, prioritize and develop an implementation plan optimize production operations.
18.10	Demonstrate strategies to optimize raw materials and products inventories to minimize waste

Program Title: **Engineering Technology**
Specialization Tract: **Quality**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Quality Assurance Technician, Process and Production Technician, or Engineering Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in lean manufacturing/production.
13.0 Demonstrate proficiency in developing self-directed work teams.
14.0 Demonstrate proficiency in the tools of lean manufacturing.
15.0 Demonstrate proficiency in Six Sigma concepts.
16.0 Demonstrate proficiency in Six Sigma theories.
17.0 Demonstrate proficiency in developing a Six Sigma project.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Quality**

Standards	
12.0	Demonstrate proficiency in lean manufacturing/production--The student will be able to:
12.01	Describe and explain the concepts of lean manufacturing.
12.02	Apply the theories of lean manufacturing to a manufacturing and service environment for improvement.
12.03	Identify and apply value stream mapping and other mapping methods.
12.04	Identify and apply just-in-time procedures.
12.05	Identify and apply the techniques in continual improvement.
12.06	Describe and explain the system of waste–free manufacturing (WFM).
12.07	Describe the changes necessary in implementing waste-free manufacturing in a lean environment.
12.08	Describe and explain supply chain management.
12.09	Describe and explain the use of the 5S's, (sort, set in order, shine, standardize, sustain).
12.10	Develop the techniques to manage change in the manufacturing environment.
12.11	Describe the concept of Nidoka, Heijunka, and quick changeover.
13.0	Demonstrate proficiency in developing self-directed work teams--The student will be able to:
13.01	Describe and explain how teams are developed.
13.02	Demonstrate how effective team members operate.
13.03	Identify the organization techniques of starting a team.
13.04	Identify the limits and expectations of the team.
13.05	Describe team problems.
13.06	Create work plans.
13.07	Identify the steps in ending a project.
13.08	Use data effectively in identifying issues.
13.09	Implement changes through planning and communications.
13.10	Update appropriate documentation in a project.
13.11	Identify the steps in ending a project.

14.0	Demonstrate proficiency in the tools of lean manufacturing--The student will be able to:
14.01	Define the tools required to implement and maintain a Lean Manufacturing facility.
14.02	Describe and explain mistake proofing for operators.
14.03	Describe the techniques using zero quality control (ZQC) techniques in manufacturing settings.
14.04	Identify mistake proof devices for eliminating errors in manufacturing.
14.05	Describe and apply the 5S's for efficiency, maintenance, and continuous improvement.
14.06	Describe and explain the visual workplace environment.
14.07	Define the terms associated with the quick changeover process.
14.08	Identify the changeover techniques used in production.
14.09	Describe and explain the streamlining process to reduce changeover time.
14.10	Describe the terms used in overall equipment effectiveness (OEE).
14.11	Describe and explain the process of total productive maintenance (TPM).
14.12	Describe and explain tracking process in improving the effectiveness of the operating equipment.
14.13	Define the terms associated with basic cellular manufacturing concepts.
14.14	Identify production teams to basic cellular manufacturing and teamwork concepts.
14.15	Identify steps required to convert to a cellular arrangement.
14.16	Identify the techniques used in the kanban system for just-in-time (JIT).
15.0	Demonstrate proficiency in Six Sigma concepts--The student will be able to:
15.01	Describe and explain the basic principles and theories of Six Sigma.
15.02	Define the terms associated with Six Sigma.
15.03	Describe the philosophy and methodology of Six Sigma.
15.04	Define the five steps of the DMAIC (define, measure, analyze, improve, and control) model used in Six Sigma for quality improvement.
15.05	Establish an advanced quality plan.
15.06	Benchmark a project.
15.07	Develop the basic cause-and-effect diagram (fishbone diagram).
15.08	Describe and develop the central limit theorem.
15.09	Develop a control plan to aid in production.
15.10	Define the cost-benefit analysis on the shop floor.
15.11	Define and describe the design of experiments (DOE) used in manufacturing processes.
15.12	Run the experiment.

	15.13 Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
	15.14 Apply the techniques of Process Failure Modes and Effects Analysis (pFMEA).
	15.15 Define and describe risk assessment.
	15.16 Implement the 5S's method of sorting, setting in order, shining, standardizing, and sustaining.
	15.17 Maintain and check the process through quality auditing.
	15.18 Apply the Six Sigma standards to non-manufacturing environments.
	15.19 Describe the role that other continuous process improvement efforts play in the workplace.
16.0	Demonstrate proficiency in Six Sigma theories--The student will be able to:
	16.01 Apply the five steps of the DMAIC model.
	16.02 Establish an advanced quality plan using the theories of Six Sigma.
	16.03 Develop the basic cause-and-effect diagram (fishbone diagram).
	16.04 Describe and develop the central limit theorem.
	16.05 Develop a control plan to aid in production.
	16.06 Define the cost-benefit analysis on the shop floor.
	16.07 Define and describe the design of experiments (DOE) used in manufacturing processes.
	16.08 Run the experiment.
	16.09 Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
	16.10 Apply the techniques of Process Failure Modes and Effects Analysis (pFMEA).
	16.11 Define and describe risk assessment.
	16.12 Implement the 5S's method of sorting, setting in order, shining, standardizing, and sustaining.
	16.13 Maintain and check the process through quality auditing.
17.0	Demonstrate proficiency in developing a Six Sigma project--The student will be able to:
	17.01 Frame and Detail a Capstone Project using the Six Sigma tools.
	17.02 Describe the economic evaluation of engineering alternatives and analysis of cost allocation.
	17.03 Calculate net profit, marginal rate of returns, maximum profit, return on investment, cash flow analysis and breakeven points when solving problems.
	17.04 Solve problems involving alternative designs, materials, or methods.
	17.05 Analyze the factor of equivalence in engineering economic problems.
	17.06 Solve problems related to replacement versus augmentation for economic choices.
	17.07 Discuss how capital projects are identified and evaluated (Return on Investment -ROI)
	17.08 Describe how final projects are selected.

17.09	Define the requirements of the project plan.
17.10	Develop the initial project schedule.
17.11	Describe each phase of the project as it relates to the budget.
17.12	Develop timeline charts for planning and tracking.
17.13	Apply the scheduling control systems.
17.14	Identify the voice of the customer as the feedback mechanism.
17.15	Define and describe the scheduling techniques when applied in the project environment.
17.16	Apply the six sigma methodology to service type environments.
17.17	Apply the Theory of Constraints to identify the obstacles, lean to remove the obstacles, and six sigma to create the standard of work and remove variations.
17.18	Understand the requirements for a successful implementation of six sigma using customer centric approach, organizational alignment, and quality improvement and how they are interdependent.
17.19	Align the Six Sigma project objectives to business strategy, and prioritize projects accordingly.
17.20	Use data collection strategies and graphical analysis in the project environment.

Program Title: **Engineering Technology**
Specialization Tract: **Mechanical Design and Fabrication**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Mechanical Engineering Technician, Mechanical Design Technician or Mechanical Fabrication Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods.
13.0 Demonstrate proficiency in the principles, concepts and applications in woodworking and composite fabrication methods.
14.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
15.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.
16.0 Demonstrate proficiency in solid modeling design and programming.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Mechanical Design and Fabrication**

Standards	
12.0	Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods--The student will be able to:
12.01	Demonstrate professionalism in the manufacturing environment.
12.02	Comprehend, use and work with precision numbers.
12.03	Interpret mechanical drawings.
12.04	Demonstrate the use of geometric dimensioning and tolerancing.
12.05	Choose appropriate materials for machining processes.
12.06	Demonstrate safe use of hand and power tools.
12.07	Identify the use and process in part layout.
12.08	Demonstrate a working knowledge of metal forming equipment.
12.09	Demonstrate the use of precision steel rulers.
12.10	Demonstrate the use of oxy-acetylene welding.
12.11	Demonstrate acceptable methods in tungsten inert gas welding.
12.12	Demonstrate acceptable methods in gas metal arc welding.
12.13	Demonstrate acceptable methods to use a dial indicator.
12.14	Explain the use of a height gauge to measure stock.
12.15	Demonstrate proper use of sheet metal tools.
12.16	Demonstrate acceptable methods hand cutting and forming sheet metal.
12.17	Demonstrate the use of layout sheet metal tools.
12.18	Demonstrate acceptable methods using micro-counter sinks.
12.19	Demonstrate acceptable methods of Riveting solid rivets.
12.20	Identify and demonstrate operation of the pneumatic rivet gun.
12.21	Demonstrate the use of a rivet gauge set.
12.22	Demonstrate acceptable methods using a back rivet set.
12.23	Demonstrate acceptable methods using bucking bars.

12.24	Demonstrate the use of rivet squeezers and dimpling.
12.25	Demonstrate acceptable methods in using a blind riveting.
12.26	Identify the axes on a CNC mill.
12.27	Demonstrate hand jog features on a CNC mill and CNC lathe.
12.28	Demonstrate acceptable methods to use an ironworker.
12.29	Demonstrate acceptable methods using a break & shear.
12.30	Demonstrate the use of precision measuring tools.
13.0	Demonstrate proficiency in the principles, concepts and applications in woodworking and composite fabrication methods--The student will be able to:
13.01	Demonstrate the safe and proper use of and the basic adjustments and maintenance according to the manufacturer's recommendations for the following equipment, to include but not limited to:
13.01.1	Saws
13.01.2	Planers
13.01.3	Jointers
13.01.4	Routers
13.01.5	Lathes
13.01.6	Drills
13.01.7	Nailers
13.01.8	Dust Collection
13.02	Set up and apply the use of clamps and vices.
13.03	Apply and use basic safety equipment (PPE).
13.04	Apply OSHA safety rules concerning PPE for eye protection.
13.05	Apply OSHA safety rules concerning PPE for hearing protection.
13.06	Identify and describe common wood working joints.
13.07	Demonstrate the use of wood glues, adhesives and epoxies.
13.08	Identify and describe rip, cross, miter, bevel, compound, and curved wood cuts.
13.09	Use wood stains and sealers.
13.10	Apply standard lumber dimensioning methods.
13.11	Identify and use basic woodworking layout tools.
13.12	Analyze lumber distortions and defects.
13.13	Define categories of hard and soft woods.

	13.14 Demonstrate or identify CNC router set-up and operation.
14.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:
	14.01 Set up and maintain a manual and/or CNC machining centers.
	14.02 Demonstrate processes using manual and/or CNC machining centers.
	14.03 Demonstrate acceptable control of machining processes.
	14.04 Identify and define chip formation, load and material removal rates.
	14.05 Demonstrate the characteristics of machining cutting tools.
	14.06 Identify or define cutting tool geometry and cutting tool materials to select tools for CNC machining.
	14.07 Demonstrate efficient CNC machining processes.
	14.08 Demonstrate the process to drill and layout holes to a specific size.
	14.09 Identify part layout techniques.
	14.10 Demonstrate machining procedures used in CNC programming.
	14.11 Identify grinding machining practices and processes.
	14.12 Demonstrate threading and tapping processes.
	14.13 Identify metal alloys and their properties in machining.
	14.14 Demonstrate job planning procedures in machining.
	14.15 Calculate cutting tool speeds and feeds.
	14.16 Adjust RPM of machining equipment.
	14.17 Identify coordinate and primary machining axes.
	14.18 Define and describe absolute and incremental coordinates.
	14.19 Identify the five basic CNC drive components.
	14.20 Demonstrate rapid travel and interpolation.
	14.21 Identify coordinate and primary machining axes.
	14.22 Identify and define manual and CNC machining operations.
	14.23 Read and edit CNC programs.
	14.24 Demonstrate acceptable procedures in starting CNC machines.
	14.25 Demonstrate the CNC machine controls for set up and operation.
	14.26 Demonstrate acceptable procedures to set up a CNC Machining center.
	14.27 Demonstrate acceptable procedures to run programs using a CNC machining center.
	14.28 Demonstrate acceptable procedures to generate a CNC program.

	14.29 Demonstrate acceptable procedures in CNC job planning.
	14.30 Select cutting tools, collets and holding fixtures.
	14.31 Identify CNC tooling and applications.
	14.32 Define CNC programming code words and conventions.
	14.33 Define and demonstrate CNC program fixed cycles.
	14.34 Demonstrate use of CAD/CAM software and processes.
	14.35 Produce student generated projects.
15.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software–The student will be able to:
	15.01 Create CAD/CAM geometry for tool path processing.
	15.02 Demonstrate procedures to import/export CAD/CAM files.
	15.03 Demonstrate contouring using CAM tool path commands.
	15.04 Apply pocketing using CAM tool path commands.
	15.05 Demonstrate drill cycles using CAM tool path commands.
	15.06 Demonstrate thread cycles using CAM tool path commands.
	15.07 Demonstrate engraving using CAM tool path commands.
	15.08 Construct lettering using CAM tool path commands.
	15.09 Demonstrate nesting using CAM tool path commands.
	15.10 Describe procedures for CAM post-processing.
	15.11 Apply tool path verification for a CAM program.
	15.12 Demonstrate tool-path operations using CAM software.
	15.13 Demonstrate ability to save, copy, delete, and rename computer files.
	15.14 Create a CAD/CAM working portfolio.
	15.15 Demonstrate the use of back plotting in a cam program.
	15.16 Demonstrate how to modify an existing tool path.
16.0	Demonstrate proficiency in 3-D solid modeling design and programming--The student will be able to:
	16.01 Identify wire frame geometry for surface modeling.
	16.02 Demonstrate tool path verification and post processing.
	16.03 Create a 3D wire frame in different construction planes.
	16.04 Demonstrate Geometry editing commands.
	16.05 Create a solid body applying extruding commands.

16.06	Demonstrate the programming parameters using high speed machining tooling.
16.07	Demonstrate CNC tooling selection and applications.
16.08	Demonstrate the chamfer command on a solid body.
16.09	Apply the revolve command by editing a solid body.
16.10	Demonstrate the fillet command on a solid body.
16.11	Create a wire frame model for a ruled surface.
16.12	Construct a sphere using primitive commands.
16.13	Apply primitive commands to construct a cylinder.
16.14	Edit solid geometry using loft commands.
16.15	Demonstrate the use of default short-cut key assignments.
16.16	Construct coons wire frame geometry.
16.17	Create sweep surfaces and flow line tool path.
16.18	Demonstrate raised letters on a surface.
16.19	Demonstrate stock set-up for tool path creation.
16.20	Identify and research emerging technologies used in 3-D modeling.

Program Title: **Engineering Technology**
Specialization Tract: **Electronics**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Electronics or Electronics Test Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in soldering and basic laboratory practices.
13.0 Demonstrate proficiency in basic direct current (DC) circuits.
14.0 Demonstrate proficiency in alternating current (AC) circuits.
15.0 Demonstrate proficiency in solid state devices.
16.0 Demonstrate proficiency in digital circuits.
17.0 Demonstrate proficiency in analog circuits.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Electronics**

Standards	
12.0	Demonstrate proficiency in soldering basic laboratory practices--The student will be able to:
12.01	Apply proper Occupational Safety Health Administration (OSHA) safety standards.
12.02	Make electrical connections.
12.03	Identify and use hand tools properly.
12.04	Identify and use power tools properly.
12.05	Explain the theoretical concepts of soldering.
12.06	Identify and discuss the different soldering techniques and arrangements for through the hole and surface mount.
12.07	Demonstrate acceptable soldering techniques.
12.08	Demonstrate acceptable de-soldering techniques.
12.09	Demonstrate electrostatic discharge (ESD) safety procedures.
12.10	Describe the construction of printed circuit boards (PCB's).
12.11	Demonstrate rework and repair techniques.
13.0	Demonstrate proficiency in basic direct current (DC) circuits--The student will be able to:
13.01	Define the characteristics of basic DC circuits.
13.02	Solve problems in electronic units utilizing metric prefixes.
13.03	Identify sources of electricity.
13.04	Define and describe voltage, current, resistance, power and energy.
13.05	Apply Ohm's law and power formulas.
13.06	Read and interpret color codes and symbols to identify electrical components and values.
13.07	Measure properties of circuits using a digital multimeter meter (DMM) and oscilloscopes.
13.08	Set up and operate power supplies for DC circuits.
13.09	Compute conductance and measure resistance of conductors and insulators.
13.10	Apply Ohm's law to series circuits.
13.11	Construct and verify the operation of series circuits.

	13.12 Analyze and troubleshoot series circuits.
	13.13 Apply Ohm's law to parallel circuits.
	13.14 Construct and verify the operation of parallel circuits.
	13.15 Analyze and troubleshoot parallel circuits.
	13.16 Measure values of resistors, capacitors and inductors.
	13.17 Construct and verify the operation of capacitors and inductors.
	13.18 Analyze and troubleshoot circuits containing capacitors and inductors.
	13.19 Apply various network theorems to DC circuits.
14.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
	14.01 Solve basic trigonometric problems as applicable to AC circuits.
	14.02 Define the characteristics of AC capacitive circuits.
	14.03 Construct and verify the operation of AC capacitive circuits.
	14.04 Analyze and troubleshoot AC capacitive circuits.
	14.05 Define the characteristics of AC inductive circuits.
	14.06 Construct and verify the operation of AC inductive circuits.
	14.07 Analyze and troubleshoot AC inductive circuits.
	14.08 Define and apply the principles of transformers to AC circuits.
	14.09 Construct and verify the operation of AC circuits utilizing transformers.
	14.10 Analyze and troubleshoot AC circuits utilizing transformers.
	14.11 Construct and verify the operation of differentiators and integrators to determine R-C and R-L time constraints.
	14.12 Analyze and troubleshoot differentiator and integrator circuits.
	14.13 Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
	14.14 Construct and verify the operation of series and parallel resonant circuits.
	14.15 Define the characteristics of series and parallel resonant circuits.
	14.16 Construct and verify the operation of series and parallel resonant circuits.
	14.17 Analyze and troubleshoot R-C, R-L, and RLC circuits.
	14.18 Define the characteristics of frequency selective filter circuits.
	14.19 Construct and verify the operation of frequency selective filter circuits.
	14.20 Analyze and troubleshoot frequency selective filter circuits.
	14.21 Define the characteristics of polyphase circuits.

	14.22 Define basic motor theory and operation.
	14.23 Define basic generator theory and operation.
	14.24 Set up and operate power supplies for AC circuits.
	14.25 Analyze and measure power in AC circuits.
	14.26 Set up and operate capacitor and inductor analyzers for AC circuits.
	14.27 Apply various network theorems to AC circuits.
15.0	Demonstrate proficiency in solid state devices--The student will be able to:
	15.01 Identify and define properties of semiconductor materials.
	15.02 Identify and define operating characteristics and applications of junction diodes.
	15.03 Identify and define operating characteristics and applications of special diodes.
	15.04 Construct and verify the operation of diode circuits.
	15.05 Analyze and troubleshoot diode circuits.
	15.06 Identify and define operating characteristics and applications of bipolar transistors.
	15.07 Identify and define operating characteristics and applications of field effect transistors.
	15.08 Identify and define operating characteristics and applications of single-stage amplifiers.
	15.09 Construct and verify the operation of single-stage amplifiers.
	15.10 Analyze and troubleshoot single-stage amplifiers.
	15.11 Construct and verify thyristor circuitry.
	15.12 Analyze and troubleshoot thyristor circuitry.
	15.13 Set up and operate DVM for solid-state devices.
	15.14 Set up and operate power supplies for solid-state devices.
	15.15 Set up and operate oscilloscopes for solid-state devices.
	15.16 Set up and operate function generators for solid-state devices.
	15.17 Set up and operate capacitor and inductor analyzers for solid-state devices.
	15.18 Set up and operate curve tracers.
	15.19 Set up and operate transistor testers.
	15.20 Construct and analyze electronic circuits for all operating parameters.
	15.21 Set up and operate measuring instruments for electronic circuit analysis.
	15.22 Apply appropriate solid state circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.
16.0	Demonstrate proficiency in digital circuits--The student will be able to:

16.01	Define and apply numbering systems to codes and arithmetic operations.
16.02	Analyze and minimize logic circuits using Boolean operations.
16.03	Set up and operate logic probes for digital circuits.
16.04	Set up and operate power supplies for digital circuits.
16.05	Set up and operate pulsers for digital circuits.
16.06	Set up and operate oscilloscopes for digital circuits.
16.07	Set up and operate logic analyzers for digital circuits.
16.08	Set up and operate pulse generators for digital circuits.
16.09	Identify types of logic gates and their truth tables.
16.10	Construct combinational logic circuits using integrated circuits.
16.11	Troubleshoot logic circuits.
16.12	Analyze types of flip-flops and their truth tables.
16.13	Construct flip-flops using integrated circuits.
16.14	Troubleshoot flip-flops.
16.15	Identify, define and measure characteristics of integrated circuit (IC) logic families.
16.16	Identify types of registers and counters.
16.17	Construct registers and counters using flip-flops and logic gates.
16.18	Troubleshoot registers and counters.
16.19	Analyze clock and timing circuits.
16.20	Construct clock and timing circuits.
16.21	Troubleshoot clock and timing circuits.
16.22	Identify types of arithmetic-logic circuits.
16.23	Construct arithmetic-logic circuits.
16.24	Troubleshoot arithmetic-logic circuits.
16.25	Identify types of encoding and decoding devices.
16.26	Construct encoders and decoders.
16.27	Troubleshoot encoders and decoders.
16.28	Identify types of multiplexer and demultiplexer circuits.
16.29	Construct multiplexer and demultiplexer circuits using integrated circuits.
16.30	Troubleshoot multiplexer and demultiplexer circuits.

	16.31	Identify types of memory circuits.
	16.32	Identify types of digital displays.
	16.33	Set up and operate measuring instruments for digital circuit analysis.
	16.34	Apply appropriate digital circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.
17.0	Demonstrate proficiency in analog circuits--The student will be able to:	
	17.01	Identify and define operational characteristics and applications of multistage amplifiers.
	17.02	Construct multistage amplifiers.
	17.03	Analyze and troubleshoot multistage amplifiers.
	17.04	Identify and define operating characteristics and applications of linear integrated circuits.
	17.05	Identify and define operating characteristics and applications of basic power supplies and filters.
	17.06	Construct basic power supplies and filters.
	17.07	Identify and define operating characteristics and applications of differential and operational amplifiers.
	17.08	Construct differential and operational amplifier circuits.
	17.09	Analyze and troubleshoot differential and operational amplifier circuits.
	17.10	Identify and define operating characteristics of audio power amplifiers.
	17.11	Construct audio power amplifiers.
	17.12	Analyze and troubleshoot audio power amplifiers.
	17.13	Identify and define operating characteristics and applications of power supply regulator circuits.
	17.14	Construct power supply regulator circuits.
	17.15	Analyze and troubleshoot power supply regulator circuits.
	17.16	Identify and define operating characteristics and applications of active filters.
	17.17	Construct active filter circuits.
	17.18	Analyze and troubleshoot active filter circuits.
	17.19	Identify and define operating characteristics and applications of sinusoidal and nonsinusoidal oscillator circuits.
	17.20	Construct oscillator circuits.
	17.21	Analyze and troubleshoot oscillator circuits.
	17.22	Identify and define operating characteristics and applications of cathode ray tubes.
	17.23	Identify and define operating characteristics and applications of optoelectronic devices.
	17.24	Set up and operate measuring instruments for analog circuits.
	17.25	Apply appropriate analog circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.

Program Title: **Engineering Technology**
Specialization Tract: **Advanced Technology**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Engineering Technician or Advanced Technology Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in soldering and basic laboratory practices.
13.0 Demonstrate proficiency in surface mount soldering.
14.0 Demonstrate proficiency in fiber optics terminations.
15.0 Demonstrate proficiency in instrumentation fundamentals.
16.0 Demonstrate proficiency in destructive and non-destructive testing.
17.0 Demonstrate proficiency in composite fundamentals.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Advanced Technology**

Standards	
12.0	Demonstrate proficiency in soldering basic laboratory practices--The student will be able to:
12.01	Apply proper Occupational Safety Health Administration (OSHA) safety standards.
12.02	Make electrical connections.
12.03	Demonstrate acceptable soldering techniques.
12.04	Demonstrate acceptable de-soldering techniques.
12.05	Demonstrate electrostatic discharge (ESD) safety procedures.
12.06	Describe the construction of printed circuit boards (PCB's).
12.07	Explain the theoretical concepts of soldering.
12.08	Demonstrate rework and repair techniques.
13.0	Demonstrate proficiency in basic surface mount soldering--The student will be able to:
13.01	Identify SMD components.
13.02	Understand concern specific to SMD components.
13.03	Identify proper soldering techniques to each component type
13.04	Solder and de-solder chip components.
13.05	Solder and de-solder J-Leaded components.
13.06	Solder and de-solder Gull Wing components.
13.07	Effectively identify and demonstrate the quality requirements used to inspect soldered connections.
13.08	Demonstrate the skills required for circuit board rework and repair.
13.09	Demonstrate the proper selection and use of procedural requirements, tools, materials, and methods required to comply with the applicable standards.
14.0	Demonstrate proficiency in fiber optics termination--The student will be able to:
14.01	Define the basics of a fiber optic system.
14.02	Define the advantages and types of a fiber optic system.
14.03	Understand how to install cables and prepare ends.

	14.04 Understand how to install different types of connectors.
	14.05 Understand how to make loss measurements.
	14.06 Understand how to install splices.
	14.07 Understand how to certify and troubleshoot a fiber system.
15.0	Demonstrate proficiency in knowledge of instrumentation fundamentals--The student will be able to:
	15.01 Demonstrate an understanding to instrument symbols and identifiers.
	15.02 Demonstrate an understanding to the fundamentals of pressure measurements.
	15.03 Demonstrate an understanding to the fundamentals of flow measurements.
	15.04 Demonstrate an understanding to the fundamentals of liquid levels measurements.
	15.05 Demonstrate an understanding to the fundamentals temperature measurements.
	15.06 Demonstrate an understanding to the fundamentals of control systems.
16.0	Demonstrate proficiency in destructive and non-destructive testing--The student will be able to:
	16.01 Demonstrate an understanding of the concepts of inspection procedures used in NDT.
	16.02 Demonstrate an understanding of the basic types of NDT.
	16.03 Demonstrate an understanding of hardness testing using both destructive and non-destructive testing.
	16.04 Demonstrate an understanding of magnetic particle testing used in NDT.
	16.05 Demonstrate an understanding of dye penetrant testing used in NDT.
	16.06 Select, configure, calibrate, and operate NDT equipment.
17.0	Demonstrate proficiency in composites fundamentals--The student will be able to:
	17.01 Identify and characterize composite materials and commodities.
	17.02 Identify uses and hazards involved in handling common composite supplies.
	17.03 Explain how properties of materials determine their classification and use.
	17.04 Identify symptoms/causes of delaminating.
	17.05 Identify symptoms and causes of faulty bonds.
	17.06 Demonstrate knowledge of handling composite materials, adhesives, solvents, etc.
	17.07 Identify tools used in composite fabrication and repair.

Program Title: **Engineering Technology**
Specialization Tract: **Alternative Energy**

Specialization Concepts and Content: The purpose of this program is to prepare students to meet the industry-specific educational needs for technicians in the new and emerging alternative and renewable energy fields, including, but not limited to, occupational titles such as: Electrical Engineering Technician, Industrial Engineering Technician, Solar Photovoltaic Installer and Solar Power Plant Technician, Solar Thermal Installer and Technician, Energy Auditor, and Smart Grid Technician. This program also provides supplemental training for persons previously or currently employed in occupations related to energy production and storage, manufacturing and construction.

Standards

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

12.0 Interpret AC and DC circuit fundamentals related to energy technologies.
13.0 Characterize alternative energy sources and technologies.
14.0 Apply energy storage, distribution and conversion systems principals.
15.0 Characterize the operation and performance of solar energy systems.
16.0 Apply policy, regulation and good business practices for alternative energy systems.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Alternative Energy**

Standards	
12.0	Interpret AC and DC circuit fundamentals related to energy technologies--The student will be able to:
12.01	Solve basic trigonometric problems as applicable to AC circuits.
12.02	Analyze and troubleshoot AC capacitive and inductive circuits.
12.03	Define and apply the principles of transformers to AC circuits.
12.04	Define the characteristics of polyphase circuits.
12.05	Define basic motor theory and operation.
12.06	Define basic generator theory and operation.
12.07	Analyze and measure power in AC circuits.
12.08	Solve problems in electronic units utilizing metric prefixes.
12.09	Identify sources of electricity.
12.10	Define and describe voltage, current, resistance, power and energy.
12.11	Apply Ohm's law and power formulas.
12.12	Read and interpret color codes and symbols to identify electrical components and values.
12.13	Measure properties of circuits using a digital multimeter meter (DMM) and oscilloscopes.
12.14	Compute conductance and measure resistance of conductors and insulators.
12.15	Construct and verify the operation of series circuits.
12.16	Analyze and troubleshoot series circuits.
12.17	Apply Ohm's law to parallel circuits.
12.18	Construct and verify the operation of parallel circuits.
12.19	Analyze and troubleshoot parallel circuits.
12.20	Measure values of resistors, capacitors and inductors.
12.21	Interpret basic AC and DC circuit schematics and sketches.
12.22	Utilize appropriate electronic testing and troubleshooting tools and equipment.
12.23	Utilize applicable voltage and current Laws in AC and DC circuits.

	12.24 Apply math knowledge required for fundamental AC and DC circuit analysis.
	12.25 Practice safety procedures required in an electrical lab environment.
13.0	Characterize alternative energy sources and technologies--The student will be able to:
	13.01 Describe alternative and renewable energy sources used for power production.
	13.02 Define basic energy terms.
	13.03 Differentiate between alternative and renewable energy sources.
	13.04 Discuss the feasibility of emerging energy resources.
	13.05 Describe the major sources, scale, and impacts of alternative and renewable energy.
	13.06 Draw and label a diagram of an alternative and renewable energy system.
	13.07 Draw and label a diagram of energy production systems that uses various alternative energy sources.
	13.08 Distinguish between various alternative energy sources and energy potential.
	13.09 Describe the social and environmental impact of alternative energy technologies vs. traditional energy sources.
	13.10 Explain the difference between passive solar and active solar systems.
	13.11 Evaluate advantages and disadvantages of various alternative energy sources.
	13.12 Compare site selection requirements for various alternative energy installations.
	13.13 Compute cost/benefit analysis and return on investment calculations for a project.
	13.14 Evaluate local, state, and federal alternative energy rebates and incentives.
14.0	Apply energy storage, distribution and conversion systems principals--The student will be able to:
	14.01 Demonstrate appropriate safety procedures of energy storage devices and equipment.
	14.02 Calculate the energy usage requirements of a typical building structure.
	14.03 Optimize the energy storage performance based on the characteristics of various battery systems.
	14.04 Define the role of inverters in energy storage systems.
	14.05 Choose an appropriate inverter for a particular application.
	14.06 Interpret interface circuit diagrams for connecting power sources to system components.
	14.07 Identify the components of an energy storage system.
	14.08 Describe current and emerging energy storage systems.
	14.09 Interpret fundamental energy and energy production concepts.
15.0	Characterize the operation and performance of solar energy systems--The student will be able to:
	15.01 Describe the operation of various solar energy systems.
	15.02 Site a solar energy system for optimal production based on the sun’s position.

	15.03	Distinguish between an azimuth and altitude calculation.
	15.04	Review the methodology for using an azimuth and altitude calculation to determine max output from a collector or concentrator.
	15.05	Specify components of solar energy systems.
	15.06	Calculate the energy produced, efficiency, and power derived from an installed system.
	15.07	Demonstrate proper safety practices in solar energy system installations and operations.
	15.08	Interpret basic schematics and sketches of various solar energy design configurations.
	15.09	Adapt the designs of solar energy systems for stand-alone and connected systems.
	15.10	Practice proper installation of solar energy system components.
	15.11	Demonstrate standard practices in system checkout, maintenance and troubleshooting a solar energy system.
	15.12	Determine appropriately sized components for a solar energy system.
	15.13	Describe benefits of alternative energy systems to the end customer through case studies.
16.0	Apply policy, regulation and good business practices for alternative energy systems--The student will be able to:	
	16.01	Define current US energy and natural resources policies and regulations.
	16.02	Compare and contrast US energy and natural resources policies and regulations to others around the world.
	16.03	Read and interpret facility energy utilization data.
	16.04	Use cost-benefit analyses to analyze various primary sources of energy.
	16.05	Discuss the effects of financial, technical, and economic trends on the past, current, and future energy industry.
	16.06	Demonstrate best practices for minimizing energy utilization.
	16.07	Apply best practices based for energy production and resources utilization.
	16.08	Determine how different climatic, geological, atmospheric, and human activities influence energy production and utilization.
	16.09	Identify conservation practices for natural resources used for energy production.
	16.10	Explain the environmental impacts of energy extraction, conservation, and storage systems.
	16.11	Discuss how the conversion to alternative energy affects various business sectors.
	16.12	Discuss the need for governmental regulations and policy for energy production and utilization.
	16.13	Compare and contrast local, state, and federal policy which positively and negatively effects the advancement of alternative energy investment and development.

Program Title: **Engineering Technology**
Specialization Tract: **Biomedical Systems**

Specialization Concepts and Content: The purpose of this program is to prepare students to meet the critical industry-specific educational needs for quality assurance, laboratory specialization, and regulatory standards that are required for the biomedical industry for initial employment with an occupational title as laboratory technician, research associate, clinical data manager, document manager, quality assurance technician, quality systems auditor, and quality compliance specialist in various specialized areas of regulated industries, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate knowledge of the Food and Drug Administration (FDA) regulations and compliance for biomedical systems.
13.0 Demonstrate knowledge in the design and manufacture of biomedical systems.
14.0 Demonstrate knowledge of risk management for biomedical products development and production.
15.0 Demonstrate knowledge of quality audits for biomedical systems.
16.0 Demonstrate knowledge of document and data management and control.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Biomedical Systems**

Standards	
12.0	Demonstrate knowledge of the Food and Drug Administration (FDA) regulations and compliance for biomedical systems--The student will be able to:
12.01	Describe how the FDA is organized.
12.02	Locate the Code of Federal Regulations (C.F.R.) specific to the FDA regulations that apply to biomedical systems manufacturers.
12.03	Describe the role of the FDA's standing advisory committee, the Center for Devices and Radiological Health (CDRH).
12.04	Define medical devices, products, and systems and their federal classifications.
12.05	Explain the 510(k) Premarket Notification Process including Applications (PMA).
12.06	Explain an investigational device exemption (IDE).
12.07	Explain the differences between Class I, II, and III devices.
12.08	Describe and explain the Federal Food, Drug, and Cosmetic Act (FDCA).
12.09	Define and describe good laboratory and clinical practices.
12.10	Define and describe the quality system regulations (QSRs).
12.11	Define and describe Current Good Manufacturing Practices.
12.12	Define and describe foreign regulatory systems, i.e., the European Union (EU).
12.13	Identify and explain the components of ISO 13485/ISO 13488.
13.0	Demonstrate knowledge in the design and manufacture of biomedical systems–The student will be able to:
13.01	Describe uses for which products could be designed.
13.02	Apply the steps identified in the FDA's regulatory requirements 21 CFR 820.30 Design Control.
13.03	Describe the various product design methodologies and their associated lifecycles.
13.04	Define, describe, and list product specifications.
13.05	Describe, list, and apply failure modes and effects analysis (FMEA) to increase product safety.
13.06	Demonstrate how various components of the design and development process effect reliability.
13.07	Describe concurrent product and process development.
13.08	Describe and compare installation and operation qualifications.
13.09	Recognize process optimization.
13.10	Develop and analyze process flow maps.

	13.11	Differentiate between verification and validation.
	13.12	Describe and determine how a design requirement is verified.
	13.13	Describe and analyze how customer needs are validated.
	13.14	Describe how a process output can be verified.
	13.15	Describe and analyze process capability.
	13.16	Define the terms associated with production scale-up.
	13.17	Describe and analyze production scheduling.
	13.18	Describe a market release package with multiple components.
	13.19	Determine a root cause of a problem is determined.
14.0	Demonstrate knowledge of risk management for biomedical products development and production–The student will be able to:	
	14.01	Describe the FDA's definition of risk management.
	14.02	Explain how the subparts to the FDA's regulatory requirements 21 CFR 820 Quality System Regulation (QSR) relate to risk management.
	14.03	Explain the process of identifying the key risk management activities critical to a successful risk management process.
	14.04	Explain the components of ISO 14971 and how they provide effective management of the risks associated with the use of medical devices.
	14.05	Explain how the components of risk management identified in ISO 14971 relate to the FDA's Quality System Regulation (QSR).
	14.06	Develop a comprehensive risk management plan.
	14.07	Identify internal and external sources for determining product hazards.
	14.08	Estimate a risk using risk analysis tools and techniques.
	14.09	Evaluate a risk using risk evaluation tools and techniques.
	14.10	Identify the steps associated with risk control.
	14.11	Identify the risk elements that can be reduced to decrease the risk associated with a hazard.
	14.12	Describe the process of verification and explain its role in risk control.
	14.13	Explain the relationship between risk control measures and the introduction of new hazards.
	14.14	Explain the difference between residual risk and overall residual.
	14.15	Develop a risk management report.
	14.16	List and describe the elements of corrective action and preventive action (CAPA) associated with Post Production Information.
15.0	Demonstrate knowledge of quality audits for biomedical systems–The student will be able to:	
	15.01	Define terms associated with quality auditing.
	15.02	Describe the characteristics of internal and external quality audits.
	15.03	Describe the relationship between the quality audit and the FDA regulatory requirement 21 CFR 820.20 (c).
	15.04	List factors that can influence the credibility of quality audits.
	15.05	Describe the purpose and characteristics of a confidentiality agreement.

	15.06	Describe the auditor's responsibilities when illegal or unsafe conditions or activities are discovered during an audit.
	15.07	Identify sources in a medical device manufacturing organization that generate performance history data for review prior to performing a quality audit.
	15.08	Identify the quality auditing strategies for data collection.
	15.09	Describe the purpose and scope of the quality audit opening and closing meetings.
	15.10	Identify auditable quality records in a medical device manufacturing company as defined by the FDA regulatory requirements 21 CFR 820.180.
	15.11	Describe the relationship of risk and criticality in analyzing audit data.
	15.12	Describe the difference between compliance issues and effectiveness issues and giving examples of each.
	15.13	Describe record retention requirements.
	15.14	Identify effective communication techniques that can be successfully used in a quality audit.
	15.15	Conduct a simulated audit that conforms to FDA regulatory requirements.
	15.16	Write a comprehensive audit report.
16.0	Demonstrate knowledge of document and data management and control–The student will be able to:	
	16.01	Describe how the change control procedures are organized.
	16.02	Locate the Code of Federal Regulations (C.F.R.) specific to the FDA regulations that apply to change control.
	16.03	Discuss the importance of maintaining the records of changes to documents.
	16.04	Review and discuss the product device master record (DMR).
	16.05	Define the terms associated with the change control documents.
	16.06	Increment and determine which code should be used by the change procedure for components including software, assemblies, devices, and associated documentation such as labeling, process procedures, and assembly drawings.
	16.07	Develop and implement a change control form.
	16.08	Describe how document management and control procedures are organized.
	16.09	Determine the importance of maintaining document management.
	16.10	Define the terms associated with document management and control.
	16.11	List the procedures to be followed for preparing, reviewing, and correcting documents.
	16.12	Discuss and explain the importance of document security.
	16.13	Develop a documentation management plan for a company.
	16.14	Define the terms associated with clinical data management.
	16.15	Describe the clinical protocol development and implementation.
	16.16	Discuss and explain the linkages between clinical trials and product development.

Program Title: **Engineering Technology**
Specialization Tract: **Digital Design and Modeling**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as computer aided design (CAD) specialists, industrial designers, product designers, architectural, civil, or mechanical drafters, technicians, or detailers in various specialized areas of industry that use digital design and modeling, or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in advanced CAD commands.
13.0 Demonstrate proficiency in three-dimensional (3-D) drawings.
14.0 Demonstrate knowledge of using solid modeling software.
15.0 Demonstrate proficiency in engineering design fundamentals.
16.0 Demonstrate proficiency in solid modeling fundamentals.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Digital Design and Modeling**

Standards	
12.0	Demonstrate proficiency in advanced CAD commands–The student will be able to:
12.01	Select the correct command for specified tasks.
12.02	Develop the standard drawing arraignment needed for generic information layout for specific drawing types.
12.03	Demonstrate proficiency in various CAD plotting and printing options.
12.04	Create and plots multiple size of drawings.
12.05	Develop the attributes and standards needed for generic information for drawing templates for specific drawings.
12.06	Implement existing CAD library files for new drawings.
12.07	Develop appropriate new library files when necessary.
12.08	Demonstrate model space and paper space commands.
12.09	Demonstrate paper space with multi Layout sheets.
12.10	Apply standard dimensioning rules for Architectural, Mechanical, and Electrical.
13.0	Demonstrate proficiency in three-dimensional (3-D) drawings–The student will be able to:
13.01	Implement the CAD commands for three-dimensional drawings.
13.02	Implement and apply the CAD three-dimensional coordinate system for three-dimensional objects.
13.03	Use CAD three-dimensional surface commands for 3-dimensional objects.
13.04	Implement and apply basic software utilities for arranging, detailing, and plotting views of an object.
13.05	Create basic building construction, architectural and object designs in three dimensions.
13.06	Align, rotate, and mirror three-dimensional objects.
13.07	Render a three-dimensional model.
13.08	Customize screen, toolbars, and pull down menus.
14.0	Demonstrate knowledge of using solid (3-D) modeling software–The student will be able to:
14.01	Create a new part document and 2-D sketch views of a solid object in drawing environment.
14.02	Apply and edit dimensions on an object.
14.03	Create the standard drawing views to document the design procedures.

	14.04 Perform analyses on the computer model and refine the design.
	14.05 Measure and calculate properties of parts.
	14.06 Enter, save, and modify data for a part drawing.
	14.07 Create bottom-up assembly drawings.
	14.08 Define parts and components of an assembly in a BOM link to an Excel directory.
	14.09 Define parts of an assembly in a directory by Balloons or Labeling.
	14.10 Apply orthographic projection principles to drawing's layouts.
	14.11 Plot solid modeling drawings.
15.0	Demonstrate proficiency in engineering design fundamentals–The student will be able to:
	15.01 Create and execute advanced templates.
	15.02 Convert multiple sketches into construction lines.
	15.03 Create and use multiple work planes for advanced functions.
	15.04 Create and modify bottom up assemblies.
	15.05 Create multiple configurations of an individual part.
	15.06 Apply basic drawing concepts to molded parts.
	15.07 Create basic sheet metal drawings.
	15.08 Create two and three-dimensional drawings related to graphic and industrial design.
	15.09 Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
	15.10 Demonstrate basic design principles of visual and spatial form as applied to products.
	15.11 Perform analyses and refine industrial design.
	15.12 Apply design features to the two and three dimensional drawings.
	15.13 Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
	15.14 Describe the theories related to product and systems design.
	15.15 Solve elementary problems related to the form and function of objects and structures.
	15.16 Describe the fundamentals of material selection for product and system design.
	15.17 Conduct a system design identifying the major phases.
	15.18 Analyze three-dimensional solid elements and 3-D thin shell bodies.
	15.19 Plot three-dimensional objects.
	15.20 Implement sustainable practices in simulation design analysis.
16.0	Demonstrate proficiency in solid modeling fundamentals–The student will be able to:

16.01	Convert sketches into extruded features.
16.02	Create the desired sketch to show the design intent in the solid modeling procedures.
16.03	Perform analyses on the sketch procedures and refine the sketch to be fully defined.
16.04	Create multiple parts using configurations manager on the design tree.
16.05	Perform advanced mating using multiple parts or sub-assemblies.
16.06	Define the type of analysis of machine elements of a parts or assembly.
16.07	Combine 11-13 Perform and interpret finite element analysis on modeled objects.
16.08	Apply basic drawing concepts to molded parts.
16.09	Create detailed molds or die cavities of parts and assemblies.
16.10	Derive component parts from an edited mold base.
16.11	Choose and apply a type of material to use to render parts.
16.12	Create and insert render parts into the sheet environment of a solid modeling drawing.
16.13	Apply the rapid prototyping processes for specific applications.
16.14	Fabricate a part or an assembly using a rapid prototype machine.
16.15	Describe the processes used in reverse engineering and scanning.
16.16	Apply reverse engineering or scanning processes for specific applications.
16.17	Fabricate a part or an assembly using reverse engineering or scanning equipment.

Program Title: **Engineering Technology**
Specialization Tract: **Digital Manufacturing**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Rapid Prototyping, Digital Manufacturing Specialists, industrial designers, product designers, architectural, civil, or mechanical drafters, technicians, or detailers in various specialized areas of industry that use digital design and modeling and rapid prototyping, direct digital manufacturing and CNC machining technologies , or to provide supplemental training for persons previously or currently employed in these occupations.

Standards

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

12.0 Demonstrate proficiency in 3D digital modeling software packages for product design.
13.0 Demonstrate proficiency in digital engineering applications for product design.
14.0 Demonstrate proficiency in the principles, concepts and applications in digital manufacturing processes.
15.0 Demonstrate proficiency in the principles, concepts and applications in fabrication techniques.
16.0 Demonstrate proficiency in the set-up and operation of manual and CNC machining centers.
17.0 Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Digital Manufacturing**

Standards	
12.0	Demonstrate proficiency in 3D digital modeling software packages for product design--The student will be able to:
12.01	Implement the CAD commands for three-dimensional drawings.
12.02	Implement and apply the CAD three-dimensional coordinate system for three- dimensional objects.
12.03	Use CAD three-dimensional surface commands for 3-dimensional objects.
12.04	Implement and apply basic software utilities for arranging, detailing, and plotting views of an object.
12.05	Create basic building construction, architectural and object designs in three dimensions.
12.06	Align, rotate, and mirror three-dimensional objects.
12.07	Render a three-dimensional model.
12.08	Customize screen, toolbars, and pull down menus.
12.09	Create a new part document and 2-D sketch views of a solid object.
12.10	Apply and edit dimensions on an object.
12.11	Create the standard drawing views to document the design procedures.
12.12	Perform analyses on the computer model and refine the design.
12.13	Measure and calculate properties of parts.
12.14	Enter and save data for an object drawing.
12.15	Create an assembly drawing.
12.16	Define parts of an assembly in a directory.
12.17	Apply basic solid modeling commands.
12.18	Apply orthographic projection principles to drawing’s layouts.
12.19	Plot solid modeling drawings.
12.20	Convert multiple sketches into extruded features.
12.21	Create the desired sketch to document the design procedures.
12.22	Perform analyses on the sketch procedures and refine the sketch design.

	12.23 Create multiple parts using components of a design tree.
	12.24 Create and insert render parts into the sheet environment of a solid modeling drawing.
	12.25 Define the type of analysis of machine elements of a part.
	12.26 Combine 11-13 perform and interpret finite element analysis on modeled objects.
	12.27 Apply basic drawing concepts to molded parts.
	12.28 Create detailed molds or die cavities of parts and assemblies.
	12.29 Derive component parts from an edited mold base.
	12.30 Choose and apply a type of material to use to render parts.
	12.31 Perform advanced mating using multiple parts or sub-assemblies.
13.0	Demonstrate proficiency in digital engineering applications for product design–The student will be able to:
	13.01 Create and execute advanced templates.
	13.02 Convert multiple sketches into construction lines.
	13.03 Create and use multiple work planes for advanced functions.
	13.04 Create and modify bottom up assemblies.
	13.05 Create multiple configurations of an individual part.
	13.06 Apply basic drawing concepts to molded parts.
	13.07 Create basic sheet metal drawings.
	13.08 Create two and three-dimensional drawings related to graphic and industrial design.
	13.09 Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
	13.10 Demonstrate basic design principles of visual and spatial form as applied to products.
	13.11 Perform analyses and refine industrial design.
	13.12 Apply design features to the two and three dimensional drawings.
	13.13 Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
	13.14 Describe the theories related to product and systems design.
	13.15 Solve elementary problems related to the form and function of objects and structures.
	13.16 Describe the fundamentals of material selection for product and system design.
	13.17 Conduct a system design identifying the major phases.
	13.18 Demonstrate the use of coordinates measuring machines.
	13.19 Demonstrate the use of optical measuring machines.

13.20	Capture physical 3D objects, and reverse engineer accurate CAD models from 3D scans.
13.21	Perform 1, 2 and 3D measurement routines.
13.22	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from industrial products.
13.23	Demonstrate ability to effectively collect, consolidate, evaluate, manage and present the information coming from manufacturing operations.
13.24	Demonstrate the use of precision hand tools.
14.0	Demonstrate proficiency in the principles, concepts and applications in digital manufacturing processes–The student will be able to:
14.01	Fabricate a part or an assembly using a rapid prototyping machine.
14.02	Compare the differing properties and characteristics of common materials used for additive manufacturing models.
14.03	Develop a part using 3D-CAD software.
14.04	Perform initial part-build setup on a 3D printer.
14.05	Describe the various additive manufacturing processes.
14.06	Define the terminology used in additive manufacturing today.
14.07	Describe the different hardware systems used in the production of prototypes, with emphasis on the specific additive manufacturing machines used in lab activities for this course.
14.08	Identify and discuss three main categories of additive manufacturing processes, including specific additive manufacturing machine types used in each of the three categories.
14.09	Describe the procedures for setting up an additive manufacturing process for a part run.
14.10	Demonstrate skill in the use of measurement tools, and dimensional analysis of additive manufacturing models.
14.11	Apply learned skills to finish additive manufacturing model projects.
14.12	Maintain Rapid Prototyping machines and support equipment in proper working order.
14.13	Communicate and execute model post process work to meet expectations.
14.14	Provide post-processing support for the completion of rapid prototype models.
15.0	Demonstrate proficiency in the principles, concepts and applications in metal fabrication methods--The student will be able to:
15.01	Understand professionalism in the manufacturing environment.
15.02	Understand, use and work with precision numbers.
15.03	Interpret mechanical drawings.
15.04	Demonstrate the use of geometric dimensioning and tolerancing.
15.05	Understand materials, and machining processes.
15.06	Demonstrate safe use of hand and power tools.

15.07	Identify the use and process in part layout.
15.08	Demonstrate a working knowledge of metal forming equipment.
15.09	Demonstrate the use of precision steel rulers.
15.10	Demonstrate the use of oxy – fuel cutting.
15.11	Demonstrate acceptable methods in tungsten inert gas welding.
15.12	Demonstrate acceptable methods in gas metal arc welding.
15.13	Demonstrate acceptable methods to use a dial indicator.
15.14	Explain the use of a height gauge to measure stock.
15.15	Demonstrate acceptable methods hand cutting and forming sheet metal.
15.16	Demonstrate the use of layout sheet metal tools.
15.17	Demonstrate acceptable methods using micro-counter sinks.
15.18	Demonstrate acceptable methods of riveting solid rivets.
15.19	Set up and apply the use of clamps and vices.
15.20	Demonstrate acceptable methods using a break and shear.
15.21	Demonstrate the use of dial calipers.
15.22	Identify and characterize composite materials and commodities.
15.23	Identify uses and hazards involved in handling common composite supplies.
15.24	Demonstrate knowledge of handling composite materials, adhesives, solvents, etc.
15.25	Identify tools used in composite fabrication and repair.
15.26	Demonstrate the safe and proper use of and the basic adjustments and maintenance for dust collection equipment according to the manufacturer's recommendations.
15.27	Demonstrate acceptable methods to use an ironworker
16.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers--The student will be able to:
16.01	Set up and maintain a manual lathe and mill.
16.02	Demonstrate acceptable processes using a manual lathe and mill.
16.03	Demonstrate acceptable control of machining processes.
16.04	Identify and define the physics of machine cutting metals.
16.05	Demonstrate the characteristics of machining cutting tools.
16.06	Define and identify parameters of cutting tool life.
16.07	Demonstrate efficient parameters in production processes.

16.08	Demonstrate the process to drill and layout holes to a specific size.
16.09	Identify baseline machining layout.
16.10	Identify manual machining procedures used in CNC programming.
16.11	Identify grinding machining practices and processes.
16.12	Identify thread types and tooling used in machining.
16.13	Identify metal alloys and their properties in machining.
16.14	Demonstrate job planning procedures in machining.
16.15	Demonstrate procedures to calculate cutting tool speeds and feeds.
16.16	Demonstrate methods for accessing machine RPM.
16.17	Identify coordinate and primary machining axes.
16.18	Define and describe absolute and incremental coordinates.
16.19	Identify the five CNC drive components.
16.20	Demonstrate rapid travel and interpolation.
16.21	Explain basic use of CAD/CAM software and processes.
16.22	Identify and define industrial machining and turning centers.
16.23	Identify processes for program creation and data management.
16.24	Demonstrate acceptable procedures in starting CNC machines.
16.25	Demonstrate the CNC machine controls for set up and operation.
16.26	Demonstrate acceptable procedures to set up a CNC Machining center.
16.27	Demonstrate acceptable procedures to run programs using a CNC machining center.
16.28	Demonstrate acceptable procedures to generate a CNC program.
16.29	Demonstrate acceptable procedures in CNC job planning.
16.30	Identify cutting tools collets and holding fixtures.
16.31	Identify CNC tooling and applications.
16.32	Define CNC programming code words and conventions.
16.33	Define and demonstrate CNC program fixed cycles.
16.34	Identify coordinate and primary machining axes.
17.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software–The student will be able to:
17.01	Create CAD/CAM geometry for tool path processing.

17.02	Demonstrate procedures to import/export CAD/CAM files.
17.03	Demonstrate contouring using CAM tool path commands.
17.04	Apply pocketing using CAM tool path commands.
17.05	Demonstrate drill cycles using CAM tool path commands.
17.06	Demonstrate thread cycles using CAM tool path commands.
17.07	Demonstrate engraving using CAM tool path commands.
17.08	Construct lettering using CAM tool path commands.
17.09	Demonstrate how to modify an existing tool path.
17.10	Describe procedures for CAM post-processing.
17.11	Apply tool path verification for a CAM program.
17.12	Apply job set-up procedures for a CAM program
17.13	Demonstrate ability to save, copy, delete, and rename computer files with Windows-based programs.
17.14	Create a CNC machining working portfolio.
17.15	Demonstrate the use of back plotting in a CAM program.
17.16	Demonstrate nesting using CAM tool path commands.

Program Title: **Engineering Technology**
Specialization Tract: **Industrial Energy Efficiency**

Specialization Concepts and Content: The purpose of this program is to prepare students to meet the industry-specific educational needs for technicians in the new and emerging industrial energy efficiency fields, including (but not limited to) occupational titles such as Manufacturing Engineering Technicians, Electronics and Electrical Repairer, and Industrial Engineering Technicians. The content includes standards and certifications surrounding energy efficiency in industrial or commercial environments, and the methods to evaluate, calculate, implement and troubleshoot components and systems to improve energy efficiency in those environments. This program also provides supplemental training for persons previously or currently employed in occupations related to energy, manufacturing and construction.

Standards

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

12.0 Evaluate energy efficiency strategies used for industrial/commercial systems.
13.0 Evaluate energy assessment methodologies for the industrial/commercial sectors.
14.0 Collect appropriate data to determine energy efficiency of industrial/commercial systems.
15.0 Implement efficient operation of industrial/commercial system components.
16.0 Implement energy efficiency strategies in industrial/commercial systems.
17.0 Troubleshoot integrated industrial/commercial utility equipment systems.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Industrial Energy Efficiency**

Standards	
12.0	Evaluate energy efficiency strategies used for industrial/commercial systems--The student will be able to:
12.01	Explain the application of cost and energy efficiency in industrial/commercial facilities.
12.02	Identify major energy-using systems in industrial/commercial facilities.
12.03	Explain energy cost control and emission reduction measures.
12.04	Describe the sources of energy appropriate to specific operational processes.
12.05	Determine the power needs and use of industrial/commercial systems.
12.06	Examine codes, standards, programs and certification requirements related to energy efficiency (e.g.: ASHRAE, LEED, CEM, ISO 50001, ISO 14001:2004).
12.07	Interpret energy use and generation.
12.08	Calculate payback period, energy savings, lifecycle cost savings, and utilize incremental analysis for alternative selection.
12.09	Discuss the role of smart grid technologies in energy conservation.
12.10	Discuss sustainable and life cycle practices, including carbon and energy management for cost-savings, energy-efficiency, and improved environmental performance.
13.0	Evaluate energy assessment methods implemented in industrial/commercial sectors--The student will be able to:
13.01	Define an energy audit/assessment process.
13.02	Define Factory Acceptance Testing, Commissioning, Re/Retro/Continuous Commissioning.
13.03	Use appropriate audit techniques for the assessment.
13.04	Identify the energy consuming components of industrial/commercial systems.
13.05	Explain assessment methods for final control elements in industrial/commercial systems.
13.06	Compare audit and assessment methods.
14.0	Collect appropriate data needed to determine energy efficiency of industrial/commercial systems--The student will be able to:
14.01	Formulate a process for acquiring and recording data.
14.02	Identify needed data.
14.03	Interpret sensor data collected from the appropriate instrumentation.
14.04	Use tools to analyze and track energy data.

	14.05	Compare calculations with expected energy use of operations.
	14.06	Report data in an appropriate format and form.
	14.07	Create an energy and carbon balance accounting report.
	14.08	Determine significant energy uses.
	14.09	Determine operating parameters of major industrial equipment, including motors, fans and pumps.
	14.10	Measure operating parameters of major industrial equipment, including motors, fans and pumps.
	14.11	Interpret psychometric charts, fan curves, pump and valve curves, and equipment performance curves.
	14.12	Use hand instrumentation, advanced instrumentation with data logging capability, thermal imaging test equipment and data loggers.
	14.13	Gather data from plant systems including smart meters, totalizators, equipment controls, plant automation systems (PLC's), and Building and Enterprise Systems (BAS and DCS).
	14.14	Demonstrate calibration of test equipment and field sensors.
	14.15	Discuss energy data reliability in terms of accuracy, precision and repeatability.
	14.16	Determine the impact of weather and other variables on energy usage.
15.0	Implement efficient operation of industrial/commercial system components--The student will be able to:	
	15.01	Evaluate efficient and expected operation of motors, fans, pumps, compressed air, pneumatics, hydraulics, refrigeration, HVAC, process cooling and heating, boilers, steam, lighting, building envelope.
	15.02	Describe duct/pipe insulation options and uses.
	15.03	Use leak detection equipment.
	15.04	Determine the proper size for equipment (motors, pumps, fan's, compressed air, process cooling and heating, etc.).
	15.05	Determine optimum operating parameters for equipment and systems (efficiency curves and part load characteristics).
	15.06	Configure variable frequency drives.
	15.07	Configure control systems including open and closed loop control.
	15.08	Demonstrate proper maintenance practices for utility systems for energy efficiency.
	15.09	Determine energy efficient locations of industrial/commercial systems components.
	15.10	Discuss selection, operation and integration of various lighting systems option.
	15.11	Program industrial equipment for energy efficient operation (intelligent controls, VFD, PLC, HVAC controls, etc.).
16.0	Implement energy efficiency strategies in industrial/commercial systems--The student will be able to:	
	16.01	Identify current programs for energy reduction.
	16.02	Identify lean principle applications for industrial/commercial systems.
	16.03	Identify lean tools for industrial/commercial systems.
	16.04	Perform an industrial/commercial energy audit.

	16.05 Analyze an energy management plan.
	16.06 Execute a measurement and verification protocol (IPMVP) to measure, verify and validate energy savings.
17.0	Troubleshoot integrated industrial/commercial equipment systems--The student will be able to:
	17.01 Discuss typical performance troubleshooting issues of integrated systems.
	17.02 Inspect equipment for real and potential energy losses and optimal performance.
	17.03 Examine equipment operation/controls for real and potential energy losses and optimal performance.
	17.04 Determine appropriate troubleshooting strategies for various industrial/commercial equipment systems.
	17.05 Monitor industrial communication to troubleshoot equipment and systems.
	17.06 Interpret industrial protocols to troubleshoot equipment and systems.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

The following industry certifications articulate have been approved by the Florida State Board of Education for statewide articulation credit into this degree program:

MSSC - Production Technician Certification (MSSCN001) – 15 credit hours

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Engineering Technology Support Specialist (0615000007) – 18 credit hours
Automation (0615040601) – 12 (Primary) or 15 (Secondary) credit hours
Lean Manufacturing (0615061302) – 12 credit hours
Mechatronics (0615000013) – 30 credit hours
Pneumatics, Hydraulics and Motors for Manufacturing (0615061303) – 12 credit hours
Lean Six Sigma Green Belt Certificate (0615070203) – 12 credit hours
Six Sigma Black Belt Certificate (0615070202) – 12 credit hours
CNC Composite Fabricator/Programmer (0615080501) – 12 credit hours
CNC Machinist/Fabricator (0648051002) – 12 credit hours
Mechanical Designer and Programmer (0615080503) – 12 credit hours
Electronics Aide (0615030313) – 12 credit hours
Applied Technology Specialist (0615061203) – 16 credit hours
Composite Fabrication and Testing (0647061602) – 12 (Primary) or 19 (Secondary) credit hours
Alternative Energy Systems Specialist (0615050303) – 18 (Primary) or 15 (Secondary) credit hours
Medical Quality Systems (0641010105) – 15 credit hours
Computer-Aided Design and Drafting (0615130304) – 24 credit hours
Rapid Prototyping Specialist (0615000012) – 12 credit hours
Digital Manufacturing Specialist (0615000009) – 24 credit hours
Industrial Energy Efficiency Specialist (0615000014) – 21 (Primary) or 24 (Secondary) credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Electronics Engineering Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615030301
Program Type	College Credit
Standard Length	68 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to DC circuits, AC circuits, solid-state devices, analog circuits, digital circuits and microprocessor systems. Integrated into this content will be communications skills, leadership skills, human relations skills, employability skills, safe and efficient work practices, use of circuit diagrams and schematics, soldering, laboratory practices and technical recording and reporting.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Electronics Engineering industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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 sixty-eight credit hours.

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current (DC) circuits.
03.0 Demonstrate proficiency in advanced direct current (DC) circuit network analysis.
04.0 Demonstrate proficiency in alternating current (AC) circuits.
05.0 Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis.
06.0 Demonstrate proficiency in solid-state devices.
07.0 Demonstrate proficiency in design and analysis of discrete solid-state circuits.
08.0 Demonstrate proficiency in analog and linear integrated circuits.
09.0 Demonstrate proficiency in digital circuits.
10.0 Demonstrate proficiency in microprocessor systems.
11.0 Demonstrate proficiency in technical recording and reporting.
12.0 Demonstrate proficiency in programming, design and analysis of microprocessor based systems.

Optional standards for programs specializing in Laser and Photonics

13.0 Demonstrate proficiency in photonics, optics, and lasers.
14.0 Demonstrate proficiency in electro-optical devices

Optional standards for programs specializing in Telecommunications

15.0 Demonstrate proficiency in telecommunications.

Optional standards for programs specializing in Robotics and Simulation

16.0 Demonstrate proficiency in robotics and automation
17.0 Demonstrate proficiency in modeling and simulation

Florida Department of Education
Student Performance Standards

Program Title: **Electronics Engineering Technology**
CIP Numbers: **1605030301**
Program Length: **68 credit hours**
SOC Code(s): **17-3023**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices--The student will be able to:
01.01	Apply Occupational Safety Health Administration (OSHA) safety standards in an electronics laboratory environment.
01.02	Make electrical wire connections to create a functional circuit.
01.03	Identify and use electrical/electronic hand and power tools (wire stripper, wire needle-nose clipper, solder and desolder station, etc.).
01.04	Explain the theoretical concepts of soldering.
01.05	Identify non-functional solder connections.
01.06	Practice acceptable soldering, de-soldering, rework, and repair techniques.
01.07	Practice electrostatic discharge (ESD) safety procedures.
01.08	Describe the construction of printed circuit boards (PCBs).
01.09	Use circuit simulation programs to solve problems, verify circuit functionality and design circuits.
01.10	Demonstrate the use of instrumentation and module analytical software.
01.11	Read and interpret data sheet specifications for electronic components.
01.12	Identify basic limitations of multimeters, oscilloscopes, function generators, and power supplies.
01.13	Use digital multi-meters (DMM), oscilloscopes, function generators, and power supplies to build, analyze and trouble shoot electrical/electronic circuits.
02.0	Demonstrate proficiency in direct current (DC) circuits--The student will be able to:
02.01	Describe the physical laws that govern electricity and magnetism.
02.02	Identify sources of electricity.
02.03	Define voltage, current, resistance, power and energy.
02.04	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.05	Read and interpret color codes and symbols to identify electrical components and values.

02.06	Measure properties of a circuit using Digital Multimeter (DMM) and oscilloscopes.
02.07	Calculate and measure the conductance and resistance of conductors and insulators.
02.08	Solve problems in electronics utilizing metric prefixes.
02.09	Apply Ohm's law and Kirchoff's voltage and current laws to solve series, parallel, and series-parallel circuits.
02.10	Construct and verify operation of series, parallel, and series-parallel circuits.
02.11	Analyze and troubleshoot series, parallel, and series-parallel circuits.
02.12	Apply Ohm's law and Kirchoff's voltage and current laws to bridge circuits.
02.13	Construct and verify the operation of bridge circuits.
02.14	Analyze and troubleshoot bridge circuits.
02.15	Identify and define voltage divider circuits (loaded and unloaded).
02.16	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.17	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.18	Apply maximum power transfer theory to determine the conditions under which maximum power transfer occurs in a circuit.
02.19	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.20	Describe magnetic properties of circuits and devices.
02.21	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.
02.22	Setup and operate power supplies for DC circuits.
03.0	Demonstrate proficiency in advanced direct current (DC) circuit network analysis--The student will be able to:
03.01	Analyze multi source circuits using superposition theorem.
03.02	Analyze circuits using Thevenin's theorem.
03.03	Analyze circuits using Norton's theorem.
03.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze circuits.
03.05	Analyze circuits using maximum power transfer theorem.
04.0	Demonstrate proficiency in alternating current (AC) circuits--The student will be able to:
04.01	Use trigonometry to solve AC circuits.
04.02	Identify properties of an AC signal.
04.03	Identify AC sources.
04.04	Analyze and measure AC signals utilizing DMM's, oscilloscope, frequency counter and function generator.
04.05	Define the characteristics of AC capacitive and inductive circuits.
04.06	Construct and verify the operation of AC capacitive and inductive circuits.

04.07	Analyze and troubleshoot AC capacitive and inductive circuits.
04.08	Define and apply the principles of transformers to AC circuits.
04.09	Construct and verify the operation of AC circuits utilizing transformers.
04.10	Analyze and troubleshoot AC circuits utilizing transformers.
04.11	Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constants.
04.12	Compute the impedance of passive RC, RL, and RLC circuits.
04.13	Analyze and troubleshoot passive differentiator and integrator circuits.
04.14	Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
04.15	Construct and verify the operation of RLC circuits (series, parallel and complex).
04.16	Define the characteristics of series and parallel resonant circuits.
04.17	Construct and verify the operation of series and parallel resonant circuits.
04.18	Analyze and troubleshoot R-C, R-L and RLC circuits.
04.19	Define the characteristics of frequency selective filter circuits.
04.20	Construct and verify the operation of frequency selective filter circuits.
04.21	Analyze and troubleshoot frequency selective filter circuits.
04.22	Define the characteristics of three-phase circuits.
04.23	Define basic motor theory and operation.
04.24	Define basic generator theory and operation.
04.25	Setup and operate power supplies for AC circuits.
04.26	Analyze and measure power in AC circuits.
04.27	Define power factor and power factor correction in AC circuits.
05.0	Demonstrate proficiency in alternating current (AC) network and coupled circuit analysis--The student will be able to:
05.01	Analyze magnetic circuits.
05.02	Apply Faraday's law of induced voltages.
05.03	Solve for mutual inductance in a coupled circuit.
05.04	Use branch current, nodal, source transformation and/or mesh current methods to analyze AC circuits.
05.05	Identify the effects of transient spikes in RC, RL, and RLC circuits.
05.06	Identify the effects of loading on transformers.
05.07	Analyze multi source circuits using superposition theorem.
05.08	Analyze circuits using Thevenin's theorem.

	05.09 Analyze circuits using Norton's theorem.
	05.10 Analyze circuits using maximum power transfer theorem.
	05.11 Analyze AC circuits using computer programs.
06.0	Demonstrate proficiency in solid-state devices--The student will be able to:
	06.01 Identify and define properties of semiconductor materials.
	06.02 Identify and define operating characteristics and applications of junction diodes.
	06.03 Identify and define operating characteristics and applications of special diodes, such as varactor diodes, LED, Zener diodes, etc.
	06.04 Construct diode circuits.
	06.05 Analyze and troubleshoot diode circuits.
	06.06 Identify and define operating characteristics and applications of bipolar junction transistors (BJT).
	06.07 Identify and define operating characteristics and applications of field effect transistors (FET).
	06.08 Identify and define operating characteristics and applications of single-stage amplifiers.
	06.09 Construct single-stage amplifiers.
	06.10 Analyze and troubleshoot single-stage amplifiers.
	06.11 Identify and define operating characteristics and applications of thyristor circuits.
	06.12 Construct thyristor circuitry.
	06.13 Analyze and troubleshoot thyristor circuitry.
	06.14 Demonstrate proficiency in the use of curve tracers and/or transistor testers.
07.0	Demonstrate proficiency in design and analysis of discrete solid-state circuits--The student will be able to:
	07.01 Construct, analyze, and troubleshoot regulator circuits using zener diodes.
	07.02 Construct, analyze, and troubleshoot bipolar junction transistor biased circuits.
	07.03 Construct, analyze, and troubleshoot field effect transistor biased circuits.
	07.04 Construct, analyze small signal amplifier circuits using bipolar junction or field effect transistors.
	07.05 Identify, define, construct, analyze, and troubleshoot multistage amplifiers.
	07.06 Identify, define, construct, analyze, and troubleshoot power amplifiers.
	07.07 Analyze low and high frequency amplifier responses.
	07.08 Discuss troubleshooting techniques applied to discrete solid state circuits.
	07.09 Discuss performance and applications for discrete solid state circuits.
	07.10 Analyze discrete solid-state circuits using computer programs.
08.0	Demonstrate proficiency in analog and linear integrated circuits--The student will be able to:

	08.01	Identify and define operating characteristics and applications of unregulated, linear, or switch-mode power supplies and basic passive filters.
	08.02	Construct, analyze, and troubleshoot unregulated power supplies and basic passive filters.
	08.03	Identify and define operating characteristics and applications of differential amplifiers including operational amplifiers.
	08.04	Construct, analyze, and troubleshoot differential and operational amplifier circuits.
	08.05	Identify and analyze different amplifier classes and their applications.
	08.06	Construct, analyze, and troubleshoot different amplifier classes.
	08.07	Identify and define characteristics of power amplifiers including audio power amplifiers.
	08.08	Solve problems in heat sinking and power limitations for audio frequency power amplifiers.
	08.09	Construct, analyze and troubleshoot power amplifier circuits including audio power amplifiers.
	08.10	Identify and define operating characteristics of power supply regulator circuits.
	08.11	Construct, analyze and troubleshoot power supply regulator circuits.
	08.12	Identify and define operating characteristics of linear integrated circuits especially operational amplifiers, including time and frequency responses.
	08.13	Construct, analyze and troubleshoot operational amplifier circuits including active filters, sinusoidal and non-sinusoidal oscillators, negative and positive feedback circuits, phase shift circuits, phase-locked loop circuits, integrator, and differentiator circuits.
	08.14	Select the integrated circuit (IC) appropriate to the defined parameters of a circuit.
	08.15	Identify and define operating characteristics and applications of optoelectronic devices i.e. opto-isolators, IR receivers, etc.
	08.16	Construct, analyze and troubleshoot optoelectronic circuits.
	08.17	Describe fundamental concepts of modulation and demodulation.
	08.18	Identify, define, construct, analyze and troubleshoot operating characteristics and applications of linear /non-linear integrated circuits/amplifier circuits.
09.0	Demonstrate proficiency in digital circuits--The student will be able to:	
	09.01	Define and apply numbering systems to codes and arithmetic operations.
	09.02	Analyze and minimize logic circuits using Boolean and Karnaugh Map (K-Map) operations.
	09.03	Demonstrate proficiency in the use of logic probes for digital circuits.
	09.04	Describe the various logic families and their electrical characteristics, i.e., transistor-transistor logic (TTL), Complimentary Metal-Oxide Semiconductor (CMOS), etc.
	09.05	Use pulsers/pulse generators/clock signals to drive the inputs of digital circuits.
	09.06	Use oscilloscopes to analyze and troubleshoot digital circuits.
	09.07	Use logic analyzers to analyze and troubleshoot digital circuits.
	09.08	Determine the fan-out of digital circuits based on IC limitations.
	09.09	List the various types of logic gates and their truth tables.

	09.10 Construct combinational logic circuits using integrated circuits.
	09.11 Troubleshoot combinational and sequential logic circuits.
	09.12 Identify and analyze types of flip-flops and their truth tables.
	09.13 Construct flip-flops using integrated circuits.
	09.14 Troubleshoot flip-flop circuits.
	09.15 Identify types of registers and counters.
	09.16 Construct registers and counters using flip-flops and logic gates.
	09.17 Troubleshoot registers and counters.
	09.18 Analyze, construct, and troubleshoot clock and timing circuits.
	09.19 Identify, construct, and troubleshoot adder/subtractor logic circuits.
	09.20 Identify, construct, and troubleshoot encoders and decoders.
	09.21 Identify, construct, and troubleshoot multiplexer and demultiplexer circuits.
	09.22 Identify types of memory circuits.
	09.23 Describe and examine the uses of digital-to-analog and analog-to-digital conversions.
	09.24 Construct and troubleshoot digital-to-analog and analog-to-digital circuits.
	09.25 Identify, construct, and troubleshoot digital display circuits.
	09.26 Identify and apply Programmable Logic Device (PLD) concepts to logic devices.
10.0	Demonstrate proficiency in microprocessor systems–The student will be able to:
	10.01 Recognize terminology used in technical literature and in industry.
	10.02 Demonstrate knowledge and architecture of the central processing units (CPU) operation and processes.
	10.03 Demonstrate the use of software to examine the operation of the CPU.
	10.04 Analyze BUS concepts.
	10.05 Identify and analyze addressing concepts.
	10.06 Write, assemble, execute, and debug software instructions and programs.
	10.07 Identify the various types of RAM and ROM memories and their interfacing to the microprocessor.
	10.08 Interface input and output devices with the microprocessor.
	10.09 Setup and operate an oscilloscope to test and evaluate a microprocessor system.
	10.10 Setup and operate a logic analyzer to test and troubleshoot a microprocessor system.
11.0	Demonstrate proficiency in technical recording and reporting--The student will be able to:
	11.01 Use computer application programs (e.g. word processor, database, spreadsheet) to create reports and record and analyze data.

11.02	Use schematic capture and simulation programs to create figures and gather data for technical reporting.
11.03	Write reports and make oral presentations.
11.04	Maintain a lab notebook documenting procedures, activities, observations, calculations, and results of conducted experiments.
12.0	Demonstrate proficiency in programming, design and analysis of microprocessor based systems--The student will be able to:
12.01	Analyze the connections for interrupt driven input/output.
12.02	Write a machine-level program and verify correct operation of simple input/output devices.
12.03	Implement the addition of RAM in a microprocessor system.
12.04	Erase and program an EEPROM.
12.05	Write a machine-level program to initialize a peripheral interface adaptor.
12.06	Analyze and draw a timing diagram showing all pertinent bus signals in a microprocessor system.
12.07	Use timing diagrams to analyze the instruction cycle of a microprocessor.
12.08	Program and interface input/output devices.
12.09	Program and interface a data link (e.g., serial, parallel, USB) using a microprocessor.
12.10	Write programs in a high-level language (e.g., C, C++, or C#) using data movement, logical and shifting instructions.
12.11	Write programs in a high-level language (e.g., C, C++, or C#) using control loops and integer arithmetic operations on arrays of numbers.
Optional standards for programs specializing in Laser and Photonics	
13.0	Demonstrate proficiency in photonics, optics and lasers–The student will be able to:
13.01	Describe the nature and properties of light.
13.02	Demonstrate the proper handling of optical components and positioning equipment.
13.03	Describe the different light sources used in the photonics industry.
13.04	Demonstrate understanding of laser safety.
13.05	Setup and operate basic optical systems.
13.06	Demonstrate understanding of geometrical and physical optics.
13.07	Demonstrate understanding of the principles of lasers.
13.08	List and describe the operational characteristics of lasers.
13.09	Categorize and explain the operation of lasers.
13.10	Explain the construction, operation, and applications of optical detectors.
13.11	Explain the principles of human vision and related laser safety issues.

	13.12 List and explain the characteristics of photonic devises used for imaging, display and storage.
	13.13 Explain the principles of fiber optic communications.
14.0	Demonstrate proficiency in electro-optical devices–The student will be able to:
	14.01 Demonstrate proficiency in fundamentals of light.
	14.02 Demonstrate proficiency in reflection, refraction, and mirrors.
	14.03 Demonstrate proficiency in measurement of maximum power and pulse energy.
	14.04 Define radiation sources, their types, properties, and applications.
	14.05 Demonstrate proficiency in measurement of detector rise time.
	14.06 Demonstrate proficiency in prisms, optical filters, resonator, and beam splitters.
	14.07 Demonstrate proficiency in characteristics of a helium-neon laser.
	14.08 Demonstrate proficiency in the use of photo detectors, and LEDs.
	14.09 Demonstrate proficiency in bandwidth in optical power measurements.
	14.10 Demonstrate proficiency in different applications of solid-state lasers.
	14.11 Demonstrate proficiency in explaining and describing different types of gases used as active media or lasers.
	14.12 Demonstrate proficiency in calculating the power, irradiance and area of a laser beam.
	14.13 Demonstrate proficiency in energy-transfer processes that increase the lower lasing level in gas lasers and solid-state lasers.
	14.14 Explain the processes that account for all the light energy striking a surface.
	14.15 Demonstrate proficiency in safety precautions when operating a laser.
	14.16 Demonstrate proficiency in four elements of a laser.
Optional standards for programs specializing in Telecommunications	
15.0	Demonstrate proficiency in telecommunications–The student will be able to:
	15.01 Demonstrate understanding of the basics of communication systems.
	15.02 Demonstrate understanding of AM modulation.
	15.03 Understand the AM spectrum.
	15.04 Demonstrate understanding of SSB modulation.
	15.05 Demonstrate understanding of the SSB spectrum.
	15.06 Demonstrate understanding of the AM demodulation process.
	15.07 Demonstrate understanding of FM modulation.

15.08	Demonstrate understanding of FM demodulation.
15.09	Demonstrate understanding of tuned LC filters.
15.10	Demonstrate understanding of the mixing up/down process and resulting spectrum.
15.11	Demonstrate understanding of the performance IF and ZIF systems.
15.12	Demonstrate understanding of impedance matching requirements.
15.13	Demonstrate understanding of the basic of receiver noise and the effect on system performance.
15.14	Demonstrate understanding of antennas, transmission lines, and radio wave propagation.
15.15	Demonstrate understanding of microwave techniques.
15.16	Demonstrate understanding of satellite communications.
15.17	Demonstrate understanding of data communications.
15.18	Demonstrate understanding of fiber-optic communications.
15.19	Demonstrate understanding of high definition television systems.
15.20	Demonstrate understanding of the telephone system and its applications.
Optional standards for programs specializing in Robotics and Simulation	
16.0	Demonstrate proficiency in robotics and automation–The student will be able to:
16.01	Describe the major parts of a robotic system.
16.02	Explain and use sensors used in robotics applications.
16.03	Describe the operation of DC motors, gearing, and electronic control.
16.04	Describe proportional and derivative feedback control systems.
16.05	Construct robot platforms.
16.06	Explain serial communications and data collection.
16.07	Write control programs for robots.
16.08	Download programs to robots and test them.
16.09	Describe shaft encoding and infrared sensing.
16.10	Explain ultrasonic distance sensing.
16.11	Describe the architecture and provide a system overview for the hardware and software found in a typical automated work cell.
16.12	Analyze and interpret typical PLC ladder logic programs.
17.0	Demonstrate proficiency in modeling and simulation–The student will be able to:

17.01	Define Interactive Simulation/Intelligent Systems/Automated Equipment, Robotics, Artificial Intelligence.
17.02	Demonstrate an understanding of Modeling and Simulation Paradigms and Concepts/Types, Randomness, Time, Application, Domain.
17.03	Demonstrate an understanding of Modeling Methods/Definition, Non-Executable Models, Executable Models, and other Model Types.
17.04	Explain Architecture and Conceptual Modeling/What does a Modeling and Simulation System do? Explain Interoperability Techniques, Live, Virtual and Constructive, Phases of Modeling.
17.05	Define Hardware - Outputs/Glasses (Filter glasses, Shutter glasses)/Sound and Audio (Human Auditory System, 3D Sound, Head-based unit)/Haptic Feedback/Visual Displays/Vestibular and Other Senses
17.06	Define Modeling, Mathematics and Physics/Geometry Modeling/Kinematics Modeling/Physical Modeling/Model Management.
17.07	Define 3D and Graphics/Computer Graphic/Dynamic Objects/Perspective Views/3D Clipping/Stereoscopic Vision/Rendering Image, Algorithms/Mapping (Texture, Bumps) Shadows, Reflection, Refraction.
17.08	Demonstrate an understanding of Applications/Creating an Application (From other Media, from an existing VR System)/Industrial (Manufacturing, Robotics)/Training Simulators/Education/Arts/Entertainment and Games/Medical/Military.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-eight credit hours according to Rule 6A-14.030, F.A.C.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.).This AS degree program includes the following College Credit Certificates:

Basic Electronics Technician (0615030310) – 14 credit hours
Electronics Technician (0615030309) – 31 credit hours
Laser and Photonics Technician (0615030411) – 12 credit hours
Robotics and Simulation Technician (0615040514) – 12 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Microelectronics Manufacturing Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615030303
Program Type	College Credit
Standard Length	68 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 17-3024 – Electro-Mechanical Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-eight credit hours.

Standards

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

01.0 Demonstrate technical communication skills.
02.0 Demonstrate basic mathematics skills.
03.0 Use basic computer systems and applications.
04.0 Demonstrate a basic understanding of DC electronics and electronics components.
05.0 Demonstrate a basic understanding and applications of instrumentation and controls.
06.0 Follow safe clean room practices and policies.
07.0 Demonstrate an understanding of metrology testing and applications.
08.0 Demonstrate a basic understanding of vacuum and pneumatic systems and their applications.
09.0 Demonstrate a basic understanding of robotic systems and their applications.
10.0 Demonstrate an understanding of microelectonic manufacturing processes.
11.0 Demonstrate a basic understanding of quality concepts and systems.
12.0 Demonstrate a basic knowledge of chemistry and physics concepts.
13.0 Demonstrate an understanding of statistical process control.
14.0 Demonstrate an understanding of material handling and delivery.

Florida Department of Education
Student Performance Standards

Program Title: **Microelectronics Manufacturing Technology**
CIP Numbers: **1615030303**
Program Length: **68 credit hours**
SOC Code(s): **17-3023, 17-3024**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate technical communication skills--The student will be able to:
01.01	Perform pass down communications.
01.02	Write technical reports.
01.03	Demonstrate proper logbook recordings.
01.04	Illustrate reports with graphs, diagrams and charts.
01.05	Demonstrate training communication skills.
01.06	Deliver oral reports to groups.
01.07	Read and follow flow charts.
02.0	Demonstrate basic mathematics skills--The student will be able to:
02.01	Solve problems for volume, weight, area, circumference and perimeter measurements for common shapes.
02.02	Measure tolerances on horizontal and vertical surfaces in any units.
02.03	Add, subtract, multiply and divide with fractions, decimals, and integers.
02.04	Solve simultaneous equations.
02.05	Solve quadratic equations.
02.06	Plot linear equations.
02.07	Perform straight line least squares fit.
02.08	Solve simple trigonometric equations.
02.09	Perform conversions between English and metric units of length, area, and volume.
02.10	Perform logarithmic calculations.
02.11	Plot logarithmic functions.
03.0	Use basic computer systems and applications--The student will be able to:

	03.01 Demonstrate an understanding of a LAN (local area network).
	03.02 Use windows based operating system.
	03.03 Demonstrate an understanding of file structures.
	03.04 Use word processing software to format and generate reports.
	03.05 Use spreadsheets to perform calculations, plot graphs, and analyze data.
	03.06 Send, retrieve and maintain electronic mail.
	03.07 Demonstrate an understanding of computer logic including flowcharting, digital components.
04.0	Demonstrate a basic understanding of DC electronics and electronic components--The student will be able to:
	04.01 Demonstrate an understanding of how and where solid state devices (transistors, diodes, silicon control rectifiers (SCR), logic devices, and electronic relays are used.
	04.02 Identify the electronic components of a power supply circuit including capacitors, inductors, and transformers.
	04.03 Perform calculations on series and parallel circuits.
	04.04 Use chart recorders, oscilloscopes, voltmeters, ammeters, and ohm meters to perform maintenance on equipment and to trouble shoot equipment problems.
	04.05 Demonstrate an understanding of single and multiphase motors.
	04.06 Understand a voltage divide circuit.
05.0	Demonstrate a basic understanding and applications of instrumental and controls--The student will be able to:
	05.01 Describe the principles of operation of mass flow controllers, temperature controllers, throttle valve, upstream and downstream pressure control.
	05.02 Describe how different temperature sensors detect (thermocouple, pyrometer).
	05.03 Identify the role of PLC.
	05.04 Identify the components of PLC.
	05.05 Know typical input and output power requirements of control devices and how they interface with PLC.
	05.06 Read pin-out diagram.
	05.07 Convert analog signal to appropriate units.
	05.08 Identify common error types and instrument limitations.
	05.09 Identify insitu monitoring techniques (optical emission, reflectance, deposition monitor, RGA).
	05.10 Understand the concept behind PID control.
	05.11 Understand the need for measuring standards.
	05.12 Perform a calibration on control instruments.
06.0	Follow safe clean room practices and polices--The student will be able to:
	06.01 Demonstrate proper gowning and degowning routines.

06.02	Identify different types of personal protection equipment, requirements, and where used.
06.03	Know the lock out tag out regulations.
06.04	Know how to read MSDS sheets and where to find necessary information (IDLH, TLV, compatibility, etc).
06.05	Know different types of warning and safety signs.
06.06	Know the use of emergency power shut off buttons.
06.07	Know the hazards associated with the use of lasers, radiations sources, RF generators, wet chemicals, compressed gas cylinders and high voltage sources.
06.08	Demonstrate safe use and appropriate housekeeping of hand and power tools (heat guns, drummel tools, hand drill, soldering guns, etc).
06.09	Demonstrate proper wafer handling techniques.
06.10	Demonstrate the need for contamination control.
07.0	Demonstrate an understanding of metrology testing and applications--The student will be able to:
07.01	Know and identify common wafer defects.
07.02	Demonstrate an understanding of how the following metrology tools work and the data that they provide:
	a. SEM (scanning electron scope)
	b. X-ray diffractions
	c. POLARON (capacitance voltage measurement)
	d. 4-point probe
	e. Hall effect
	f. RPL (Rapid Photo Luminescence)
	g. FTIR (Fourier Transform Infra-Red spec)
	h. Ellipsometer
	i. Laser surface profile
	j. Visual image comparison
	k. Profilometer
	l. Atomic force microscope
08.0	Demonstrate an understanding of vacuum and pneumatic systems and their applications--The student will be able to:
08.01	Identify and describe pressure gauges and how they work, where used and (baratron, thermocouple, pirani, cold cathode, piezoelectric) principles of operation and ranges of use.
08.02	Identify and describe vacuum pumps and how they work, where used and (baratron, thermocouple, pirani, cold cathode, piezoelectric).
08.03	Identify types of vacuums pumps (turbo, cryo, mechanical, rotary vane, dry sroll) and applications.

	08.04	Demonstrate use of a leak detector and techniques for use.
	08.05	Define crossover pressure and why it is important.
	08.06	Verify calibration of gauge.
	08.07	Perform routine maintenance on pumps.
	08.08	Understand the concept of virtual leaks and techniques to minimize.
	08.09	Understand the concept of back streaming and how to minimize.
	08.10	Identify welds and joints (VCR, quick flange, VCO, ISO, conflat, compression fittings, ultratorr).
	08.11	Identify valve types (bellows, diaphragm, gates, isolation, ball), their applications for use, modes of failure, and how they are used.
09.0	Demonstrate a basic understanding of robotic systems and their applications--The student will be able to:	
	09.01	Understand the operation of a stepper motor, servo motor, and encoders.
	09.02	Calibrate position and timing.
	09.03	Identify types of feed-through mechanisms.
	09.04	Identify types of robotic sensors (optical, mechanical, time) and how to use (home, limit, pressure, etc).
	09.05	Program a simple robot movement.
10.0	Demonstrate an understanding of microelectronic manufacturing process--The student will be able to:	
	10.01	Demonstrate an understanding of the following wafer manufacturing processes:
		a. plasma etch (ECR, HDP, RIE)
		b. photolithography
		c. thermal processing (diffusion, oxidation, RTA)
		d. deposition (APCVD, LPCVD, PECVD, PVD)
		e. crystal growth (MOCVD, LPE, MBE)
		f. wet processing
		g. implant
		h. polishing (CMP)
	10.02	Create a process flow for a simple device.
11.0	Demonstrate a basic understanding of quality concepts and systems--The student will be able to:	
	11.01	Demonstrate a basic understanding of the role of quality systems in industry.
	11.02	Demonstrate a basic understanding of the quality implementation processes and procedures.
	11.03	Demonstrate teamwork skills including: active listening, leadership skills, team member skills, valuing team members' inputs, recognition of barriers, sharing duties and responsibilities.
	11.04	Use a problem solving methodology to solve quality improvement (QI) issues.

	11.05 Understand the importance of teamwork in different workplace settings.
12.0	Demonstrate a basic knowledge of chemistry and physics concepts--The student will be able to:
	12.01 Identify chemical elements from their symbols and placement on periodic table.
	12.02 Describe the basic atomic structure of specific elements.
	12.03 Describe the three basic states of matter.
	12.04 Identify the basic properties of acids, bases, and salts.
	12.05 Identify the basic characteristics of ionic and covalent bonds.
	12.06 Read and interpret simple chemical reactions.
	12.07 Perform gas law calculations.
	12.08 Describe a mole.
	12.09 Solve simple work and energy problems.
	12.10 Solve simple force and pressure problems.
	12.11 Describe magnetism.
	12.12 Describe waves and identify their properties.
	12.13 Describe basic optical components and how they work.
	12.14 Solve simple ohm's law circuit problems.
13.0	Demonstrate an understanding of statistical process control--The student will be able to:
	13.01 Define basic statistical parameters including mean, mode, median, standard deviation, etc).
	13.02 Identify different distributions patterns including normal and skewed distributions.
	13.03 Read and interpret histograms, scatter plots, xbar-range, and control charts.
	13.04 Define control limits and specs limits.
	13.05 Know why industry uses SPC.
	13.06 Define the term process capability.
14.0	Demonstrate an understanding of material handling and delivery--The student will be able to:
	14.01 Identify the components of a gas delivery systems (cylinders, valves, cabinets, valve manifold box, coax tubing, gas detection sensors, regulators, integrated engineering control for facility.
	14.02 Describe how flow balance systems work including vent run balance, dilution network.
	14.03 Know cylinder change out procedures (cycle purges, venturi, gasket compatibility).
	14.04 Know the importance of component material compatibility system.
	14.05 Know how liquid sources are delivered to processes (hazards, temperature dependence).
	14.06 Identify components of bulk liquid delivery systems to processes (pressurized or pumped delivery, bleedlines, liquid and vapor sensor).
	14.07 Identify different types of scrubbing methods (chemical, charcoal absorption, burnt boxes, water base scrubber) and their applications.

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Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Biomedical Engineering Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615040101
Program Type	College Credit
Standard Length	61 credit hours (Primary), 62 credit hours (Secondary)
CTSO	SkillsUSA
SOC Codes (all applicable)	51-9082 – Medical Appliance Technicians 31-9093 – Medical Equipment Preparers 49-9062 – Medical Equipment Repairers
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to designing, manufacturing, evaluating, troubleshooting, repairing and testing various types of biomedical equipment. Additionally, students will learn to function in a hospital or industry environment through an internship at a local biomedical department. During the internship, students will be assigned routine duties as biomedical equipment technicians.

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 sixty-one credit hours.

Standards

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

01.0 Apply verbal skills.
02.0 Apply mathematical skills.
03.0 Apply basic software skills related to biomedical engineering technology.
04.0 Understand basic pneumatics, fluidic, and mechanical principles.
05.0 Understand basic biomedical principles.
06.0 Understand basic networking principles.
07.0 Understand basic electronics/computer principles.
08.0 Understand laser/optics principles.

Florida Department of Education
Student Performance Standards

Program Title: **Biomedical Engineering Technology**
CIP Numbers: **1615040101**
Program Length: **61 credit hours**
SOC Code(s): **51-9082, 31-9093, 49-9062**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Apply verbal skills–The student will be able to:
01.01	Apply written composition principles.
01.02	Demonstrate verbal presentation approaches.
01.03	Demonstrate proficiency in verbal and written communication.
01.04	Demonstrate reasoning and creative thinking ability.
01.05	Apply word processing skills for technical report writing.
01.06	Work effectively in a team environment.
02.0	Apply mathematical skills–The student will be able to:
02.01	Understand mathematical functions, algebra, and complex numbers.
02.02	Understand exponential and logarithmic functions and graphs.
02.03	Identify systems of linear equations.
02.04	Apply trigonometric functions.
02.05	Understand statistical measures and quality control.
02.06	Use a graphing calculator for computer-assisted analysis.
02.07	Demonstrate proficiency in solving basic algebraic expressions and systems of equations.
02.08	Analyze technical applications with computer and calculator-based tools.
02.09	Interpret elementary statistical measures.
03.0	Apply basic software skills related to biomedical engineering technology–The student will be able to:
03.01	Understand word processing software functions.
03.02	Understand database software functions.
03.03	Understand spreadsheet software functions.

	03.04 Understand Computer Aided Design (CAD) software functions.
	03.05 Understand Internet functions.
	03.06 Demonstrate proficiency in using word processors for written reports and communication.
	03.07 Demonstrate proficiency in searching and working with databases.
	03.08 Demonstrate proficiency in using spreadsheets for basic data analysis.
	03.09 Demonstrate proficiency in using CAD to analyze basic biomedical systems.
	03.10 Demonstrate proficiency using CAD to troubleshoot basic biomedical systems.
	03.11 Demonstrate proficiency in utilizing Internet resources.
04.0	Understand basic pneumatics, fluidic, and mechanical principles–The student will be able to:
	04.01 Identify fluidic and pneumatic signals.
	04.02 Understand fluidic and pneumatic diagrams.
	04.03 Understand uses and operation of biomedical fluid valves.
	04.04 Understand uses and operation of biomedical pneumatic valves and regulators.
	04.05 Use biomedical instrumentation.
	04.06 Demonstrate proficiency in reading fluidic and pneumatic diagrams.
	04.07 Demonstrate proficiency in troubleshooting basic mechanical, fluidic, and pneumatic systems.
05.0	Understand basic biomedical principles–The student will be able to:
	05.01 Understand basic anatomy and physiology.
	05.02 Understand basic medical terminology.
	05.03 Understand principles of selected biomedical instrumentation.
	05.04 Identify biomedical sensors and transducers.
	05.05 Identify selected biomedical instruments.
	05.06 Use biomedical instrumentation.
	05.07 Demonstrate proficiency in data collection and basic data analysis for research, development, or manufacturing of biomedical applications.
	05.08 Demonstrate proficiency in analyzing selected biomedical instrumentation.
	05.09 Demonstrate proficiency in testing selected biomedical instrumentation.
	05.10 Demonstrate proficiency in calibrating selected biomedical instrumentation.
	05.11 Demonstrate proficiency in troubleshooting and repairing selected biomedical instrumentation.
	05.12 Demonstrate proficiency in maintenance of selected biomedical instrumentation.
06.0	Understand basic networking principles–The student will be able to:

06.01	Understand basic network hardware technologies.
06.02	Understand basic network software technologies.
06.03	Demonstrate proficiency in understanding broad-based vendor independent network hardware technologies such as:
	a. Local Area Networks (LAN)
	b. Wide Area Networks (WAN)
06.04	Demonstrate proficiency in understanding basics in principle software protocols such as TCP/IP functions.
06.05	Demonstrate proficiency in relating network technology to real world applications in the biomedical field such as:
	a. Laboratory Information Systems (LIS)
	b. Hospital Information Systems (HIS)
	c. Medical Instrumentation Interfacing
	d. Network Security
07.0	Understand basic electronics/computer principles–The student will be able to:
07.01	Understand basic electrical signals.
07.02	Understand basic linear/nonlinear DC analysis.
07.03	Understand basic linear AC analysis.
07.04	Understand basic digital analysis.
07.05	Utilize electrical passive, active, linear, and non-linear components.
07.06	Understand electrical diagrams.
07.07	Understand microprocessors and microcontrollers.
07.08	Understand power systems.
07.09	Understand data acquisition techniques.
07.10	Understand computer interface concepts.
07.11	Understand biomedical instrumentation.
07.12	Demonstrate proficiency in reading electrical diagrams.
07.13	Demonstrate proficiency in analyzing basic electrical systems.
07.14	Demonstrate proficiency in troubleshooting basic electrical systems.
07.15	Demonstrate proficiency in repairing basic electrical systems.
07.16	Demonstrate proficiency in electrical measurements.
07.17	Demonstrate proficiency in computer interfacing.
07.18	Demonstrate proficiency in loading system software in computer based equipment.

	07.19 Demonstrate proficiency in hardware replacement in computer based equipment.
08.0	Understand laser/optics principles–The student will be able to:
	08.01 Understand basic light and optics principles.
	08.02 Understand photocells.
	08.03 Understand light sensors.
	08.04 Understand lasers and safety protocols.
	08.05 Understand biomedical instrumentation.
	08.06 Understand principles of aligning and troubleshooting basic biomedical optical systems.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-one credit hours according to Rule 6A-14.030, F.A.C.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Computer Integrated Manufacturing Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615061306
Program Type	College Credit
Standard Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	51-4011 – Computer-Controlled Machine Tool Operators, Metal and Plastic 17-3023 – Electrical and Electronic Engineering Technicians 17-3024 – Electro-Mechanical Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to calibration of production line equipment, integration of controllers with work cells, bar code tracking systems, vision systems, retrieval systems, production planning operating and maintaining production equipment and test instruments, CIM systems analysis, data communications, CAD systems and quality assurance.

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 sixty-four credit hours.

Standards

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

01.0 Demonstrate proficiency in machines and mechanisms.
02.0 Demonstrate proficiency in manufacturing processes.
03.0 Demonstrate proficiency in operating and maintaining manufacturing equipment for automated assembly.
04.0 Demonstrate proficiency in evaluating the efficiency and performance of individual production line equipment.
05.0 Demonstrate proficiency in integrating production equipment with work cells, programmable logic controllers and area controllers.
06.0 Demonstrate proficiency in bar coding, automatic tracking vision systems and automatic storage and retrieval systems for materials handling.
07.0 Demonstrate proficiency in manufacturing software applications used for production planning, quality control and shop floor data collection.
08.0 Demonstrate proficiency in programming and controlling production machines in a flexible automation environment.
09.0 Demonstrate proficiency in operating and maintaining production test equipment and instruments.
10.0 Demonstrate proficiency in CIM systems analysis.
11.0 Demonstrate proficiency in installing, maintaining and understanding network and data communications devices.
12.0 Demonstrate proficiency in basic use of computer assisted drafting (CAD) and design equipment used in a manufacturing environment.
13.0 Demonstrate proficiency in use of quality assurance methods and statistical process control techniques.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Integrated Manufacturing Technology**
CIP Numbers: **1615061306**
Program Length: **64 credit hours**
SOC Code(s): **51-4011, 17-3023, 17-3024**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in machines and mechanisms--The student will be able to:
01.01	Identify, define and analyze various electromechanical systems, including pneumatic, hydraulic and electrical.
01.02	Construct flow diagrams of electromechanical system.
01.03	Analyze and identify mechanical linkages (gears, pulleys, limit switches, etc.).
01.04	Analyze and identify electromechanical devices (motors, servos, relays, stepping switches, timing devices, etc.).
01.05	Analyze and identify sensing elements.
01.06	Analyze and identify optical scanning and encoding/decoding devices.
01.07	Analyze and identify error sensing/feedback and control mechanisms.
02.0	Demonstrate proficiency in manufacturing processes--The student will be able to:
02.01	Understand current manufacturing processes.
02.02	Understand the use of current manufacturing machines, operating systems and mechanisms.
02.03	Understand hydraulic, electrical and pneumatic devices used in production assembly and materials handling.
02.04	Understand OSHA, state, and local safety requirements for the manufacturing and assembly operations with automated equipment.
02.05	Understand manpower needs and skills needed in assembly operations.
02.06	Understand integration requirements for charging conventional manufacturing to CIM.
02.07	Understand the criteria for tool design, maintenance, procurement and handling.
02.08	Understand gage design, usage and limitations.
02.09	Understand the requirements and solutions for raw materials orientation and clamping.
02.10	Analyze and recommend the usage of jigs and fixtures, including effectors and special grippers for robotics.
02.11	Understand the concepts and considerations required for products manufactured from sheet metal.
02.12	Understand the special equipment required for sheet metal fabrication and forming.

	02.13 Understand concepts of injection molding equipment.
	02.14 Understand the concepts involved in the process of designing and fabricating specialized tools for numerical controlled machine application.
	02.15 Understand the concepts and special considerations involved with operating computer numerical control equipment.
	02.16 Understand the functions of the industrial computer and microprocessor controls in modern manufacturing.
03.0	Demonstrate proficiency in operating and maintaining manufacturing equipment for automated assembly--The student will be able to:
	03.01 Interpret blueprints, schematics and technical manuals.
	03.02 Establish routine operations involving maintenance schedules.
	03.03 Analyze system failures.
	03.04 Perform minor repairs to CIM systems.
	03.05 Coordinate and specify maintenance service.
	03.06 Evaluate need for equipment replacement, overhaul and retooling.
04.0	Demonstrate proficiency in evaluating the efficiency and performance of individual production line equipment--The student will be able to:
	04.01 Design the routing, storage and procurement/distribution systems for raw and finished products.
	04.02 Analyze and utilize statistical data from process control systems.
	04.03 Describe the relationship of equipment utilization to the manufacturing economy.
	04.04 Prepare and evaluate justifications for specification deviations.
05.0	Demonstrate proficiency in integrating production equipment with workcells, programmable logic controllers and area controllers--The student will be able to:
	05.01 Design analog and digital control systems along with applicable software to specific manufacturing requirements.
	05.02 Chart and analyze ladder logic diagrams for manufacturing processes.
	05.03 Develop and analyze flow charts from ladder diagrams and related process controls.
	05.04 Operate programmable logic controllers with device drivers.
	05.05 Apply software to work cells and area controllers.
	05.06 Integrate control systems and equipment with production and production support mechanisms.
06.0	Demonstrate proficiency in bar coding, automatic tracking vision systems and automatic storage and retrieval systems for materials handling--The student will be able to:
	06.01 Describe automatic inventory accounting and control system.
	06.02 List the underlying principles and method of controlling work in progress.
	06.03 Analyze product flow cycle.
	06.04 Describe warehouse throughput systems.
	06.05 Implement automated tracking in the laboratory environment.

	06.06 Describe machine vision applications.
	06.07 Maintain machine vision and sensing system equipment.
07.0	Demonstrate proficiency in manufacturing software applications used for production planning, quality control and shop floor data collection--The student will be able to:
	07.01 Apply proficiency in manufacturing software application packages.
	07.02 Analyze data collection systems for maintaining the progress of each order.
	07.03 Assign and maintain priorities of individual orders.
08.0	Demonstrate proficiency in programming and controlling production machines in a flexible automation environment--The student will be able to:
	08.01 Define and analyze product manufacturing requirements and process.
	08.02 Identify the responsibilities of management in produced production.
	08.03 Integrate personnel, hardware and software capabilities for the timely completion of product manufacturing.
	08.04 Describe the relationship of quality assurance and manufacturing.
	08.05 Apply the basic principles underlying the relationship between systems design, production and manufacturing engineering.
	08.06 Apply manufacturing simulation packages used in layout and design of production operations.
	08.07 Apply manufacturing resources planning and just-in-time concepts in production planning operations.
	08.08 Apply engineering economy factors in equipment justification.
	08.09 Apply microprocessor controls to a modern manufacturing system.
09.0	Demonstrate proficiency in operating and maintaining production test equipment and instruments--The student will be able to:
	09.01 Specify, interconnect and operate instruments and test equipment.
	09.02 Analyze normal and abnormal instrument readings and their probable causes.
	09.03 Specify and operate Automatic Test Equipment (ATE) procedures, using required software and hardware.
	09.04 Troubleshoot control systems mechanisms and software.
	09.05 Repair faults in production equipment and specify external repairs or overhaul requirements.
	09.06 Align, calibrate and maintain related ATE interfaces and circuits.
	09.07 Prepare error probability charts and graphs.
10.0	Demonstrate proficiency in CIM systems analysis--The student will be able to:
	10.01 Describe the concepts of a generic CIM system.
	10.02 Analyze and identify problems with the operation of industrial computers, controllers and hardware.
	10.03 Utilize typical screens and files available to shop floor operations for troubleshooting and data collection.
	10.04 Operate industrial terminals, input/output communications interface devices, etc., found in the manufacturing environment.

11.0	Demonstrate proficiency in installing, maintaining and understanding network and data communications devices--The student will be able to:
11.01	Identify and apply communications protocols.
11.02	Identify and apply networks and classifications.
11.03	Identify and apply throughput, memory size/capabilities and standards benchmark.
11.04	Identify and apply computer options for sharing directories, files and servers.
11.05	Select and apply sensors and feedback devices.
11.06	Select and interconnect cabling, repeaters, modems and multiplexers.
12.0	Demonstrate proficiency in basic use of computer assisted drafting (CAD) and design equipment used in a manufacturing environment--The student will be able to:
12.01	Operate CAD systems and hardware.
12.02	Apply CAD support software to manipulate interval files, attributes, database exchange files, and set-up.
12.03	Apply CAD software to create, edit, and update drawings and files.
12.04	Identify and define protocols and software used to download CAD to CAM.
12.05	Describe the relationship and functions of CAD in the industrial production environment.
13.0	Demonstrate proficiency in use of quality assurance methods and statistical process control techniques--The student will be able to:
13.01	Describe the concept of quality assurance in increasing productivity and promoting zero defects.
13.02	Apply data collection methods for productivity improvement and reporting.
13.03	Analyze productivity data, identify problem areas and evaluate the cause and effect relationship.
13.04	Develop and apply quality improvement strategies.
13.05	Develop and apply QA methods and techniques for production and product handling in a CIM environment.
13.06	Understand process capability and its applications.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

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Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-four credit hours according to Rule 6A-14.030, F.A.C.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Computer Automation Technology (0615040604) – 33 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Manufacturing Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615061307
Program Type	College Credit
Standard Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-9041 – Architectural and Engineering Managers 17-3020 – Aerospace Engineering and Operations Technicians 41-4011 – Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products 17-3027 – Mechanical Engineering Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-four credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-four credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Perform engineering support.
02.0 Perform corrective maintenance.
03.0 Perform preventive maintenance.
04.0 Maintain product quality standards.
05.0 Perform material handling procedures.
06.0 Apply workplace safety practices.
07.0 Apply process engineering change notices.
08.0 Demonstrate appropriate communication skills.
09.0 Demonstrate appropriate math skills.
10.0 Demonstrate appropriate understanding of basic science.
11.0 Demonstrate employability skills.
12.0 Demonstrate an understanding of entrepreneurship.

Florida Department of Education
Student Performance Standards

Program Title: **Manufacturing Technology**
CIP Numbers: **1615061307**
Program Length: **64 credit hours**
SOC Code(s): **11-9041, 17-3020, 41-4011, 17-3027**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Perform engineering support–The student will be able to:
01.01	Modify or adjust equipment per engineering specifications.
01.02	Modify or recommend modifications to incorrect engineering drawings, schematics or blueprints.
01.03	Setup or modify new equipment per engineering specifications.
02.0	Perform corrective maintenance--The student will be able to:
02.01	Define the problem
02.02	Interview operator regarding the problem.
02.03	Identify any recent changes in the system.
02.04	Identify the symptoms.
02.05	Isolate potential sources/causes of problems.
02.06	Identify exact source/cause of problems.
02.07	Consult reference materials.
02.08	Evaluate repair options.
02.09	Document repairs and adjustments made.
02.10	Document final settings.
02.11	Notify the affected area team leader of the resolution of the problem.
03.0	Perform preventive maintenance–The student will be able to:
03.01	Develop preventive maintenance plan.
03.02	Follow preventive/predictive maintenance procedures.
03.03	Clean the equipment.
03.04	Perform general inspections.

	03.05 Report abnormalities requiring maintenance.
	03.06 Perform minor repairs.
	03.07 Rebuild equipment, sub-assemblies, and components.
	03.08 Ensure suitability of replacement parts.
	03.09 Replace sub-assemblies/components.
04.0	Quality maintain product quality standards–The student will be able to:
	04.01 Monitor process for quality.
	04.02 Inspecting product for quality.
	04.03 Document quality measurements or observations by filling out quality charts and records.
	04.04 Compare process measurements to standards.
	04.05 Identify root cause.
	04.06 Take corrective action.
05.0	Perform material handling procedures–The student will be able to:
	05.01 Determine types of material/hazardous materials.
	05.02 Select appropriate handling tools/machinery.
	05.03 Perform material handling procedures with appropriate safety procedures.
	05.04 Complete appropriate documentation inventory, hazardous materials etc.
06.0	Apply workplace safety practices–The student will be able to:
	06.01 Communicate any new or revised safety procedures.
	06.02 Update personnel about current safety guidelines.
	06.03 Wear personal safety equipment.
	06.04 Follow area-posted safety guidelines.
	06.05 Follow OSHA guidelines.
	06.06 Maintain a clean and safe work environment.
	06.07 Maintain personal safety equipment.
	06.08 Report unsafe conditions/practices.
	06.09 Locate emergency exits and alarms.
	06.10 Comply with company-established safety practices.
	06.11 Use appropriate fire fighting procedures.
07.0	Apply process engineering change notices–The student will be able to:

	07.01	Review effects of Engineering Change Notices (ECNs).
	07.02	Take action on ECNs.
	07.03	Implement action on ECNs.
	07.04	Update ECN database.
08.0	Demonstrate appropriate communication skills--The student will be able to:	
	08.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	08.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	08.03	Read and follow written and oral instructions.
	08.04	Answer and ask questions coherently and concisely.
	08.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
	08.06	Demonstrate appropriate telephone/communication skills.
09.0	Demonstrate appropriate math skills--The student will be able to:	
	09.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	09.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	09.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	09.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	09.05	Demonstrate an understanding of federal, state and local taxes and their computation.
10.0	Demonstrate appropriate understanding of basic science--The student will be able to:	
	10.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	10.02	Draw conclusions or make inferences from data.
	10.03	Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	10.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
11.0	Demonstrate employability skills--The student will be able to:	
	11.01	Conduct a job search.
	11.02	Secure information about a job.
	11.03	Identify documents which may be required when applying for a job interview.
	11.04	Complete a job application form correctly.
	11.05	Demonstrate competence in job interview techniques.
	11.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.

	11.07 Identify acceptable work habits.
	11.08 Demonstrate knowledge of how to make job changes appropriately.
	11.09 Demonstrate acceptable employee health habits.
	11.10 Demonstrate knowledge of the "Florida Right-To-Know Law".
12.0	Demonstrate an understanding of entrepreneurship--The student will be able to:
	12.01 Define entrepreneurship.
	12.02 Describe the importance of entrepreneurship to the American economy.
	12.03 List the advantages and disadvantages of business ownership.
	12.04 Identify the risks involved in ownership of a business.
	12.05 Identify the necessary personal characteristics of a successful entrepreneur.
	12.06 Identify the business skills needed to operate a small business efficiently and effectively.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Safety Engineering Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615070101
Program Type	College Credit
Standard Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	29-9011 – Occupational Health and Safety Specialist 29-9012 – Occupational Health and Safety Technicians 17-2111 – Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and skills to technically assist in analyzing working conditions and providing technical assistance in the maintenance of materials, equipment, and fire safety systems.

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 sixty-four credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-four credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Read and interpret blueprints and schematics.
02.0 Develop drawings or sketches of safety devices or plant layouts.
03.0 Demonstrate understanding of safety engineering techniques.
04.0 Analyze workplace environmental elements.
05.0 Demonstrate understanding of methods for correcting or preventing unsafe conditions.
06.0 Perform cost analyses of corrective measures.
07.0 Interpret related legislation.
08.0 Read, interpret, and write technical reports.
09.0 Develop safety training programs for hazardous work environments.
10.0 Demonstrate appropriate communication skills.
11.0 Demonstrate appropriate math skills.
12.0 Demonstrate appropriate understanding of basic science.
13.0 Demonstrate employability skills.
14.0 Demonstrate an understanding of entrepreneurship.

2014 – 2015

Florida Department of Education
Student Performance Standards

Program Title: **Safety Engineering Technology**
CIP Numbers: **1615070101**
Program Length: **64 credit hours**
SOC Code(s): **29-9011, 29-9012, 17-2111**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Read and interpret blueprints and schematics--The student will be able to:
01.01	Identify commonly used symbols and lines.
01.02	Read architect's scale and engineer's scale.
01.03	Identify mechanical symbols.
01.04	Read and interpret blueprints and specifications.
02.0	Develop drawings or sketches of safety devices or plant layouts--The student will be able to:
02.01	Convert actual distance to blueprint/sketch dimensions.
02.02	Develop sketches from data.
03.0	Demonstrate understanding of safety engineering techniques--The student will be able to:
03.01	Apply sound/noise control concepts to operating equipment.
03.02	Apply equipment guarding techniques to operating equipment.
03.03	Determine dust control measures needed in an operational situation.
04.0	Analyze work place environmental elements--The student will be able to:
04.01	Analyze air samples for dust.
04.02	Analyze air samples for toxic fumes.
04.03	Determine minimum exposure times for workers, using a D6 meter.
04.04	Analyze the ergonomics of a work site.
05.0	Demonstrate understanding of methods for correcting or preventing unsafe conditions--The student will be able to:
05.01	Explain the purpose of the American National Standards Institute and similar organizations.
05.02	Using standards tables, compute the minimum acceptable standards for state situations.
05.03	Using State and Federal Code and Regulations, determine acceptable work place standards.

	05.04 Set up a preventative maintenance schedule for a facility and equipment.
06.0	Perform cost analysis of corrective measures--The student will be able to:
	06.01 Compute cost benefit and cost of alternative corrective measures.
	06.02 Compute cost of down time versus cost of maintenance.
	06.03 Compute cost of repairs versus cost of replacements, including tax benefits to company.
07.0	Interpret related legislation--The student will be able to:
	07.01 Explain how legislative or Congressional action becomes regulation.
	07.02 Explain how regulatory agencies determine final regulation.
	07.03 Given a specific regulation, explain how to get regulatory agency clarification.
	07.04 Determine how equipment and work conditions comply with state regulations.
08.0	Read, interpret and write technical reports--The student will be able to:
	08.01 Summarize a technical report.
	08.02 Develop bar and line graphs.
	08.03 Write a justification for corrective action.
09.0	Develop safety training programs for hazardous work environments--The student will be able to:
	09.01 Perform a job safety analysis.
	09.02 Determine the safe and proper methods for doing a job.
	09.03 Develop a training plan to insure development of proper work habits in workers trained.
	09.04 Develop a refresher training program to review the safe and efficient methods of working in a hazardous area.
10.0	Demonstrate appropriate communication skills--The student will be able to:
	10.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	10.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	10.03 Read and follow written and oral instructions.
	10.04 Answer and ask questions coherently and concisely.
	10.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	10.06 Demonstrate appropriate telephone/communication skills.
11.0	Demonstrate appropriate math skills--The student will be able to:
	11.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	11.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	11.03 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.

	11.04 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.
	11.05 Demonstrate an understanding of federal, state and local taxes and their computation.
12.0	Demonstrate appropriate understanding of basic science--The student will be able to:
	12.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	12.02 Draw conclusions or make inferences from data.
	12.03 Identify health related problems which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.
	12.04 Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.
13.0	Demonstrate employability skills--The student will be able to:
	13.01 Conduct a job search.
	13.02 Secure information about a job.
	13.03 Identify documents which may be required when applying for a job interview.
	13.04 Complete a job application form correctly.
	13.05 Demonstrate competence in job interview techniques.
	13.06 Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	13.07 Identify acceptable work habits.
	13.08 Demonstrate knowledge of how to make job changes appropriately.
	13.09 Demonstrate acceptable employee health habits.
	13.10 Demonstrate a knowledge of the "Florida Right-To-Know Law".
14.0	Demonstrate an understanding of entrepreneurship--The student will be able to:
	14.01 Define entrepreneurship.
	14.02 Describe the importance of entrepreneurship to the American economy.
	14.03 List the advantages and disadvantages of business ownership.
	14.04 Identify the risks involved in ownership of a business.
	14.05 Identify the necessary personal characteristics of a successful entrepreneur.
	14.06 Identify the business skills needed to operate a small business efficiently and effectively.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Aerospace Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615080100
Program Type	College Credit
Standard Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3021 – Aerospace Engineering and Operations Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-four credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-four credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate appropriate communications skills.
02.0 Demonstrate appropriate math skills.
03.0 Demonstrate appropriate understanding of basic science.
04.0 Demonstrate understanding of safe, efficient, professional work practices.
05.0 Demonstrate the knowledge, testing and repair of spacecraft systems.
06.0 Demonstrate the use and maintenance of industry tools.
07.0 Perform basic electricity, electronic and fiber optics skills.
08.0 Demonstrate an understanding of appropriate safety/OSHA rules and regulations.
09.0 Demonstrate the ability to fabricate component parts to specifications.
10.0 Prepare, analyze and evaluate technical reports and data.
11.0 Demonstrate the ability to evaluate problems, troubleshoot and implement appropriate corrective action.
12.0 Select, configure, calibrate, operate and evaluate precision, non-destructive test equipment.
13.0 Demonstrate appropriate knowledge of the operation and repair of high pressure hydraulic and pneumatic systems.
14.0 Demonstrate employability skills.

Florida Department of Education
Student Performance Standards

Program Title: **Aerospace Technology**
CIP Numbers: **1615080100**
Program Length: **64 credit hours**
SOC Code(s): **17-3021**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate appropriate communications skills--The student will be able to:
01.01	Write logical and understandable statements, or phrases, to complete with accuracy the forms/invoices commonly used in business and industry.
01.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
01.03	Read and follow written and oral instructions.
01.04	Answer and ask questions coherently and concisely.
01.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
01.06	Demonstrate appropriate telephone/communication skills
02.0	Demonstrate appropriate math skills--The student will be able to:
02.01	Work with the common sets of real numbers in performing the four basic operations.
02.02	Use the four basic operations in working with polynomial expressions.
02.03	Solve linear equations in one variable and applied problems.
02.04	Solve linear inequalities in one variable and applied problems.
02.05	Factor polynomials.
02.06	Simplify algebraic fractions, complex fractions and solve rational and literal equations and applied problems.
02.07	Extract roots and raise numbers to a given power.
02.08	Determine areas and volumes of various geometrical shapes.
02.09	Solve ratio, proportion, and percentage problems.
02.10	Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.
02.11	Graph linear equations and inequalities in two variables and solve graph systems of linear equations and inequalities in two variables.
02.12	Solve and graph quadratic equations and inequalities with real solutions and solve related word problems.

	02.13 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.
	02.14 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.
	02.15 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.
	02.16 Determine the correct purchase price, to include sales tax, for a materials list containing a minimum of six items.
	02.17 Demonstrate an understanding of federal, state and local taxes and their computation.
03.0	Demonstrate appropriate understanding of basic science--The student will be able to:
	03.01 Identify and characterize materials and commodities used in the aerospace industry.
	03.02 Demonstrate a basic knowledge of material science.
	03.03 Identify uses and hazards involved in handling common materials and commodities used in the aerospace industry.
	03.04 Identify materials compatibility/incompatibility.
	03.05 Demonstrate knowledge of chemical processes involved in metal treatments and polymerization.
	03.06 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.
	03.07 Draw conclusions or make inferences from data.
	03.08 Understand pressure measurement in terms of P.S.I., inches of mercury, and KPA.
	03.09 Recognize modes and manifestations' of corrosion.
	03.10 Identify various types of contamination.
	03.11 Identify symptoms and causes of metal failure (e.g., fatigue, ductile, brittle).
	03.12 Identify symptoms/causes of faulty bonds and delaminations.
	03.13 Demonstrate knowledge of spacecraft fuels and oxidizers.
	03.14 Demonstrate knowledge of characteristics and handling of cryogenics.
	03.15 Demonstrate knowledge of characteristics and handling of hypergolics.
	03.16 Identify appropriate emergency procedures.
04.0	Demonstrate understanding of safe efficient professional work practices--The student will be able to:
	04.01 Observe work area rules and regulations.
	04.02 Tether tools and personal items.
	04.03 Log tools (ingress/egress).
	04.04 Follow clean room/controlled environment procedures.
	04.05 Conduct pre-shift/post-shift tool, materials, equipment, and supplies inventory.
	04.06 Follow proper foreign object debris (FOD) procedures.
	04.07 Inspect for foreign object debris (FOD).

	04.08 Demonstrate good housekeeping practices.
	04.09 Demonstrate knowledge of static electricity hazards.
	04.10 Demonstrate professional work ethics.
	04.11 Demonstrate knowledge of ISO 9000.
	04.12 Demonstrate knowledge of quality assurance sciences.
	04.13 Demonstrate knowledge of computer applications in quality programs.
05.0	Demonstrate the knowledge, testing and repair of spacecraft systems--The student will be able to:
	05.01 Identify spacecraft systems and sub systems and how they relate to the entire spacecraft.
	05.02 Demonstrate understanding of the operation of spacecraft systems.
	05.03 Identify operational differences between expendable and reusable spacecraft.
	05.04 Demonstrate knowledge of basic principles of hydraulics/pneumatics.
	05.05 Demonstrate knowledge of basic principles of pyrotechnic devices.
	05.06 Demonstrate knowledge of basic principles of rocket propulsion.
	05.07 Demonstrate knowledge of basic principles of electro-mechanical systems.
	05.08 Demonstrate basic knowledge of ground support equipment.
	05.09 Assemble/disassemble components from various systems.
	05.10 Demonstrate basic knowledge of how to modify or rework major systems and components to close tolerances.
	05.11 Perform fit check/functional test.
	05.12 Operate ground support equipment (GSE).
	05.13 Operate switches, circuit breakers and valves.
	05.14 Demonstrate a knowledge of thermal barriers.
06.0	Demonstrate the use and maintenance of industry tools--The student will be able to:
	06.01 Identify proper tools.
	06.02 Inspect tools for cleanliness.
	06.03 Inspect tools for functionality.
	06.04 Clean/decontaminate tools/equipment.
	06.05 Demonstrate knowledge of hoisting and rigging techniques.
07.0	Perform basic electricity, electronic and fiber optics skills--The student will be able to:
	07.01 Measure capacitance and inductance.
	07.02 Calculate and measure electrical power.

	07.03 Measure voltage, current, resistance, continuity, and leakage.
	07.04 Determine the relationship of voltage, current, and resistance in electrical circuits
	07.05 Read and interpret electrical circuit diagrams.
	07.06 Inspect and service batteries.
	07.07 Utilize proper electrical safety procedures.
	07.08 Demonstrate basic knowledge of wire wrapping, potting, crimping, cable lacing and repair.
	07.09 Demonstrate basic soldering skills and the identification of components common to electronics.
	07.10 Troubleshoot electrical systems.
	07.11 Demonstrate knowledge of safety procedures when handling fiber optics.
	07.12 Demonstrate knowledge of different types of fiber optic materials and their characteristics.
	07.13 Make terminations, splices, and connections.
	07.14 Test fiber optic systems using various test equipment.
	07.15 Perform fiber optic troubleshooting and diagnosis.
08.0	Demonstrate an understanding of appropriate safety/OSHA rules and regulations--The student will be able to:
	08.01 Identify workplace hazards.
	08.02 Use appropriate personal protective equipment.
	08.03 Use appropriate lifting techniques.
	08.04 Place catch nets/bags.
	08.05 Set up safe work zone.
	08.06 Implement lock out/tag out.
	08.07 Use buddy system where required.
	08.08 Monitor breathing zones and wind direction.
	08.09 Interpret safety equipment readings.
	08.10 Demonstrate knowledge of safety/OSHA regulations.
	08.11 Identify hazardous materials handling.
	08.12 Demonstrate appropriate fire extinguisher use.
	08.13 Demonstrate safe confined space entry procedure.
09.0	Demonstrate the ability to fabricate component parts to specifications--The student will be able to:
	09.01 Demonstrate a basic knowledge of applied trigonometry.
	09.02 Demonstrate a basic knowledge of machine tools.

	09.03 Interpret a basic drawing/blueprint.
	09.04 Produce a layout/template.
	09.05 Fabricate a sample project.
	09.06 Demonstrate the use of brake and shear.
	09.07 Demonstrate the ability to finish a component per given requirements.
	09.08 Demonstrate the use of precision measuring tools including micrometer and vernier caliper, square, etc.
	09.09 Fabricate a project per drawings and specifications.
	09.10 Demonstrate knowledge of metal joining processes (e.g., welds, brazing, etc.).
	09.11 Complete a repair project per drawings and specifications.
	09.12 Inspect finished product for conformity.
10.0	Prepare, analyze and evaluate technical reports and data--The student will be able to:
	10.01 Interpret technical drawings and schematics.
	10.02 Demonstrate application of technical drawings and/or schematic specifications.
	10.03 Interpret work authorization documents.
	10.04 Demonstrate application of work authorization document to task.
	10.05 Perform technical reporting and documentation.
	10.06 Demonstrate knowledge of work team protocols (engineering support).
11.0	Demonstrate the ability to evaluate problems, troubleshoot and implement appropriate corrective actions--The student will be able to:
	11.01 Evaluate a given job.
	11.02 Select appropriate equipment for a given job.
	11.03 Select appropriate materials and supplies for a given job.
	11.04 Identify essential personnel for a given job.
	11.05 Apply troubleshooting skills where necessary.
	11.06 Identify and take corrective action where necessary.
12.0	Select, configure, calibrate, operate and evaluate precision test equipment--The student will be able to:
	12.01 Select appropriate test equipment for given test.
	12.02 Verify tool and equipment calibration.
	12.03 Configure test set up.
	12.04 Perform test operations.
	12.05 Evaluate test results.

	12.06 Identify precision measuring and test equipment.
	12.07 Differentiate between destructive and non-destructive testing.
13.0	Demonstrate appropriate knowledge of the operation and repair of high pressure hydraulic and pneumatic systems--The student will be able to:
	13.01 Identify various mechanical connections.
	13.02 Demonstrate knowledge of the function of regulators, valves, and gauges.
	13.03 Identify unique safety requirements and hazards involved with various fluid systems.
	13.04 Identify and inspect components and conduits for compatibility with commodities.
	13.05 Differentiate between dedicated and multi-purpose components and conduits.
	13.06 Assemble, operate, inspect, and test fluid systems.
14.0	Demonstrate employability skills--The student will be able to:
	14.01 Conduct a job search.
	14.02 Secure information about a job.
	14.03 Identify acceptable work habits.
	14.04 Demonstrate knowledge of how to make appropriate job changes.
	14.05 Demonstrate ability to pass Aerospace Technician Certification written, oral and performance tests.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

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Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Simulation Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615080101
Program Type	College Credit
Standard Length	68 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3021 – Aerospace Engineering and Operations Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-eight credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-eight credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate proficiency in installation and assembly.
02.0 Demonstrate proficiency in testing.
03.0 Demonstrate proficiency in quality control and customer relations.
04.0 Demonstrate proficiency in troubleshooting.
05.0 Demonstrate proficiency in repair.
06.0 Demonstrate proficiency in calibration.
07.0 Demonstrate proficiency in maintenance.
08.0 Demonstrate proficiency in A+ computer operating systems.
09.0 Demonstrate proficiency in electronics assembly and cabling.
10.0 Demonstrate proficiency in A+ computer hardware.
11.0 Demonstrate proficiency in network plus.
12.0 Demonstrate proficiency in professional and customer service.
13.0 Demonstrate proficiency in electronic devices and circuits.
14.0 Demonstrate proficiency in computer software applications.
15.0 Demonstrate proficiency in DC/AC circuits and lab.

Florida Department of Education
Student Performance Standards

Program Title: **Simulation Technology**
CIP Numbers: **1615080101**
Program Length: **68 credit hours**
SOC Code(s): **17-3021**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in installation and assembly--The student will be able to:
01.01	Identify safety issues.
01.02	Identify components.
01.03	Use appropriate grounding techniques.
01.04	Read instructions.
01.05	Identify tools and other resources needed.
01.06	Obtain documentation.
01.07	Remove bad part(s) if applicable.
01.08	Perform hardware/software installation.
01.09	Complete documentation.
01.10	Clean up workspace.
02.0	Demonstrate proficiency in testing--The student will be able to:
02.01	Read test instructions.
02.02	Identify test tools and equipment.
02.03	Identify documentation resources.
02.04	Follow industry safety standards.
02.05	Turn power on.
02.06	Perform electro-mechanical tests.
02.07	Perform bench tests.
02.08	Document test results.
02.09	Generate V.V. and A test results.

03.0	Demonstrate proficiency in quality control and customer relations--The student will be able to:
	03.01 Generate V.V. and A test results.
	03.02 Market company products/services.
	03.03 Identify need for R and D.
	03.04 Recommend upgrades.
	03.05 Listen to the customer.
	03.06 Explain simulator operations and limitations to customer.
	03.07 Interact with engineers and customers.
04.0	Demonstrate proficiency in troubleshooting--The student will be able to:
	04.01 Review user log.
	04.02 Perform diagnostic tests.
	04.03 Verify functional/operational discrepancy.
	04.04 Perform sensory inspection.
	04.05 Identify failed sub system.
	04.06 Determine if hardware or software problem.
	04.07 Identify failed component.
05.0	Demonstrate proficiency in repair--The student will be able to:
	05.01 Determine priority of repair.
	05.02 Schedule repair time.
	05.03 Identify tools and other resources required.
	05.04 Replace simulated vehicle components.
	05.05 Replace computer components.
	05.06 Replace motion components.
	05.07 Replace control components.
	05.08 Replace aural cue components.
	05.09 Replace linkage I/O components.
	05.10 Replace power distribution components.
	05.11 Replace visual sub system components.
	05.12 Repair analog devices to component level.
	05.13 Replace fire safety system components.

	05.14 Replace lighting system components.
	05.15 Replace avionics components.
	05.16 Replace communication/navigation system components.
06.0	Demonstrate proficiency in calibration--The student will be able to:
	06.01 Assure calibration of alignment tools.
	06.02 Perform visual display alignment.
	06.03 Perform mechanical alignment.
	06.04 Perform electrical alignment.
	06.05 Perform software alignment.
07.0	Demonstrate proficiency in maintenance--The student will be able to:
	07.01 Perform DORTS.
	07.02 Replace or clean air/fluid filters.
	07.03 Perform visual inspection of motion system.
	07.04 Perform hydraulic fluid analysis.
	07.05 Perform computer and peripheral diagnostics.
	07.06 Check power sub system.
	07.07 Perform SIM vehicle housekeeping.
	07.08 Check liquid cooling system.
	07.09 Check the U.P.S. system.
08.0	Demonstrate proficiency in A+ computer operating systems--The student will be able to:
	08.01 Determine if hardware or software problem.
	08.02 Identify computer software.
	08.03 Perform computer operations using Windows and Unix/Linux operating systems.
09.0	Demonstrate proficiency in electronics assembly and cabling--The student will be able to:
	09.01 Turn power on in sequence.
	09.02 Remove bad part(s) if applicable.
	09.03 Identify tools and other resources needed.
	09.04 Obtain documentation.
	09.05 Read instructions.
	09.06 Identify components.

	09.07 Perform steps to assemble IPC-601 certification.
	09.08 Learn **E**lectro**s**tatic **D**ischarge (E.S.D.).
10.0	Demonstrate proficiency in A+ computer hardware--The student will be able to:
	10.01 Perform hardware/software installation.
	10.02 Replace computer computers.
	10.03 Perform computer and peripheral diagnosis.
	10.04 Identify and learn Bus architecture.
11.0	Demonstrate proficiency in network plus--The student will be able to:
	11.01 Describe the functions and elements of a computer network.
	11.02 Describe and compare clients, servers, peers, client-server networks, peer-to peer networks.
	11.03 Describe and compare the characteristics, capacities, and uses of common used types of bounded and unbounded network media.
	11.04 Describe the functions and uses of network protocols and models.
	11.05 Describe the functions, methods, and implementations of the seven layers of the Open Systems Interconnect model.
	11.06 Describe the functionality, protocols, and uses of leading network protocol stacks.
	11.07 Given a business scenario, apply appropriate networking concepts to create a practical network design.
12.0	Demonstrate proficiency in professional and customer service--The student will be able to:
	12.01 Listen to the customer.
	12.02 Market company products/services.
	12.03 Interact with engineers and customers.
	12.04 Advance in the field.
13.0	Demonstrate proficiency in electronic devices and circuits--The student will be able to:
	13.01 Replace analog devices to component level.
	13.02 Analyze operational amplifiers and semiconductor devices and circuits.
	13.03 Analyze power supply circuits, data conversion circuits and differential amplifiers.
14.0	Demonstrate proficiency in computer software applications--The student will be able to:
	14.01 Define and explain elementary computer terms and concepts such as hardware, software, operating system, etc.
	14.02 Explain and use operating system commands necessary to load and run software packages, such as formatting blank disks, listing a directory, deleting a file, copying a file, copying a disk.
	14.03 Demonstrate appropriate care and handling of a computer, its peripherals, and software materials.

	14.04	Summarize rules for legal and illegal duplication of software.
	14.05	Select from among specific software packages used or demonstrated, the best one(s) to use for such tasks as retrieval, calculating, planning, research writing, and communicating.
	14.06	Demonstrate the uses of a spreadsheet package.
	14.07	Use a spreadsheet package to enter a spreadsheet on the computer, perform sensitivity analysis using that spreadsheet and produce a printed report/printed graphic display.
	14.08	Explain the uses of a word processing package.
	14.09	Use a word processing package to create and save a document, make changes to that document, and format and print the document.
	14.10	Explain the uses of a database management package.
	14.11	Use a data base management package to create a data file, query the database, update a data file, and generate a printed report.
	14.12	Use e-mail and the Internet to do research.
	14.13	Make a presentation using PowerPoint.
15.0	Demonstrate proficiency in DC/AC circuits and lab--The student will be able to:	
	15.01	Use appropriate grounding techniques.
	15.01	Learn AC/DC theory.
	15.02	Read schematics and breadboard a basic circuit from a schematic diagram.
	15.03	Solve problems using units conversion and scientific notation.
	15.04	Solve problems involving electric charge, electric current, potential difference and energy.
	15.05	Solve problems using Ohm's Law.
	15.06	Solve problems for the resistance of metallic conductors.
	15.07	Solve problems in electric circuits involving work and power.
	15.08	Solve problems involving series and parallel resistance circuits.
	15.09	Solve problems involving series/parallel resistance circuits.
	15.10	Solve problems involving capacitance in DC circuits.
	15.11	Solve problems involving magnetic circuits.
	15.12	Solve problems involving inductance in DC circuits.
	15.13	Solve AC problems involving peak value, instantaneous, average value and RMS value of a sine wave.
	15.14	Solve problems on factors governing reactance in AC circuits.
	15.15	Solve electrical problems using phases mathematics.
	15.16	Solve impedance problems in AC circuits.
	15.17	Use an oscilloscope, a multimeter, a power supply, a signal generator to analyze basic electrical circuits.
	15.18	Prepare and complete concise, neat and accurate lab reports.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Computer Engineering Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1615120100
Program Type	College Credit
Standard Length	68 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	15-1199 – Computer Occupations, All Other
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

Purpose

This program offers a sequence of courses that provides coherent and rigorous content aligned with industry and academic standards and applied technical knowledge and skills needed to prepare for further education and careers such as Applications engineer, Controls engineer, Design engineer, Embedded hardware engineer, Embedded software engineer, Field engineer, Instrumentation engineer, Sales engineer, Systems engineer; 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 computer systems architecture, software engineering, computer communications, programming, and analysis and design of computer systems and will prepare graduates with skills necessary to enter careers in the design, development, analysis, application, installation, operation, and/or maintenance of computer systems and their associated software systems.

This degree program includes a highly technical core that addresses essential skills and knowledge in electronics (Standards 1-5) and computing (Standards 6-9). These core standards prepare individuals to assemble, install, operate, maintain, troubleshoot and repair computer and electronic equipment used in industry by providing a comprehensive foundation in the design, theory, and analysis of computer and electronic systems and applications.

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 68 hours, of which a minimum of 40 hours is allocated to the core standards 01.0 through 09.0.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-eight credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate proficiency in laboratory practices.
02.0 Demonstrate proficiency in direct current circuits and network analysis.
03.0 Demonstrate proficiency in alternating current circuits and network analysis.
04.0 Demonstrate proficiency in analog electronics.
05.0 Demonstrate proficiency in digital electronics.
06.0 Demonstrate proficiency in microcomputers and computer systems architecture.
07.0 Demonstrate proficiency in software engineering fundamentals.
08.0 Demonstrate proficiency in the analysis and design of data and computer communications systems.
09.0 Demonstrate proficiency with high-level computer programming languages, data structures, and operating system principles emphasizing the hardware/software interface.
10.0 Demonstrate appropriate communication skills.
11.0 Demonstrate appropriate math skills at or above the level of algebra and trigonometry.
12.0 Demonstrate appropriate understanding of the natural sciences.
13.0 Demonstrate employability skills.
14.0 Demonstrate proficiency in technical recording and reporting.
15.0 Understand, install, configure and troubleshoot issues relating to computer hardware and software.

Florida Department of Education
Student Performance Standards

Program Title: **Computer Engineering Technology**
CIP Numbers: **1615120100**
Program Length: **68 credit hours**
SOC Code(s): **15-1199**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate proficiency in laboratory practices–The student will be able to:
01.01	Apply proper Occupational Safety Health Administration (OSHA) safety standards.
01.02	Make proper electrical wire connections.
01.03	Identify and use electrical/electronic hand tools properly (wire stripper, wire nose, clippers, etc.).
01.04	Identify and use power tools associated with electrical/electronic industry properly (solder and de-solder station, etc.).
01.05	Explain the theoretical concepts of soldering.
01.06	Identify proper solder connections.
01.07	Demonstrate acceptable soldering techniques.
01.08	Demonstrate acceptable de-soldering techniques.
01.09	Demonstrate solder rework and repair techniques.
01.10	Demonstrate electrostatic discharge (ESD) safety procedures.
01.11	Describe the construction of printed circuit boards (PCBs).
01.12	Demonstrate proficiency in the use of an operating system.
01.13	Demonstrate proficiency in the use of a high level computer language.
01.14	Demonstrate proficiency in the use of microcomputer application programs (i.e., word processing, data base, spreadsheet, power point).
01.15	Demonstrate the use of microcomputer circuit simulation programs.
01.16	Demonstrate the use of microcomputer and instrumentation and module analytical software.
01.17	Load operating system and application software.
01.18	Read and interpret data sheet specifications for electronic components.
01.19	Demonstrate proficiency in the use of multi-meters.
01.20	Demonstrate proficiency in the use of oscilloscopes.

01.21	Demonstrate proficiency in the use of function generators.
01.22	Demonstrate proficiency in the use of power supplies.
01.23	Identify basic limitations of multi-meters, oscilloscopes, function generators, and power supplies.
02.0	Demonstrate proficiency in direct current circuits and network analysis–The student will be able to:
02.01	Solve algebraic problems applied to DC circuits.
02.02	Solve problems in electronic units utilizing metric prefixes.
02.03	Relate electricity to the nature of matter.
02.04	Identify sources of electricity.
02.05	Define voltage, current, resistance, power and energy.
02.06	Apply Ohm's law and power formulas to electrical/electronic circuits.
02.07	Read and interpret color codes and symbols to identify electrical components and values.
02.08	Measure properties of a circuit using digital multimeter (DMM) and oscilloscopes.
02.09	Calculate conductance and compute and measure the resistance of the conductors and insulators.
02.10	Apply Ohm's law and Kirchoff’s s voltage and current laws to series circuits.
02.11	Construct and verify operation of series circuits.
02.12	Analyze and troubleshoot series circuits.
02.13	Apply Ohm's law and Kirchoff’s s voltage and current laws to parallel circuits.
02.14	Construct and verify the operation of parallel circuits.
02.15	Analyze and troubleshoot parallel circuits.
02.16	Apply Ohm's law and Kirchoff's voltage and current laws to series-parallel and parallel-series circuits.
02.17	Construct and verify the operation of series-parallel and parallel-series and bridge circuits.
02.18	Analyze and troubleshoot series-parallel and parallel-series and bridge circuits.
02.19	Identify and define voltage divider circuits (loaded and unloaded).
02.20	Construct and verify the operation of voltage divider circuits (loaded and unloaded).
02.21	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).
02.22	Apply maximum power transfer theory.
02.23	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.
02.24	Describe magnetic properties of circuits and devices.
02.25	Define resistor-capacitor (R-C) and resistor inductor (R-L) time constants and classify the output of differentiators and integrators.
02.26	Setup and operate power supplies for DC circuits.

	02.27 Analyze multi source circuits using superposition theorem.
	02.28 Analyze circuits using Thevenin's theorem.
	02.29 Analyze circuits using Norton's theorem.
	02.30 Use mesh currents, branch currents, nodal, and/or source transformation analysis to analyze circuits.
	02.31 Analyze circuits using maximum power transfer theorem.
	02.32 Analyze DC circuits using computer programs.
03.0	Demonstrate proficiency in alternating current circuits and network analysis–The student will be able to:
	03.01 Solve basic trigonometric problems as applicable to electronics (prerequisite to AC).
	03.02 Identify properties of an AC signal.
	03.03 Identify AC sources.
	03.04 Analyze and measure AC signals utilizing VOM, DVM, oscilloscope, frequency counter and function generator.
	03.05 Define the characteristics of AC capacitive circuits.
	03.06 Construct and verify the operation of AC capacitive circuits.
	03.07 Analyze and troubleshoot AC capacitive circuits.
	03.08 Define the characteristics of AC inductive circuits.
	03.09 Construct and verify the operation of AC inductive circuits.
	03.10 Analyze and troubleshoot AC inductive circuits.
	03.11 Define and apply the principles of transformers to AC circuits.
	03.12 Construct and verify the operation of AC circuits utilizing transformers.
	03.13 Analyze and troubleshoot AC circuits utilizing transformers.
	03.14 Construct and verify the operation of passive differentiators and integrators to determine R-C and R-L time constraints.
	03.15 Compute the impedance of passive RC, RL, and RLC circuits.
	03.16 Analyze and troubleshoot passive differentiator and integrator circuits.
	03.17 Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
	03.18 Construct and verify the operation of RLC circuits (series, parallel and complex).
	03.19 Define the characteristics of series and parallel resonant circuits.
	03.20 Construct and verify the operation of series and parallel resonant circuits.
	03.21 Analyze and troubleshoot R-C, R-L and RLC circuits.
	03.22 Define the characteristics of frequency selective filter circuits.
	03.23 Construct and verify the operation of frequency selective filter circuits.

03.24	Analyze and troubleshoot frequency selective filter circuits.
03.25	Define the characteristics of polyphase circuits.
03.26	Define basic motor theory and operation.
03.27	Define basic generator theory and operation.
03.28	Setup and operate power supplies for AC circuits.
03.29	Analyze and measure power in AC circuits.
03.30	Define power factor and power factor correction in AC circuits.
03.31	Set up and operate capacitor and inductor analyzers for AC circuits.
03.32	Analyze magnetic circuits.
03.33	Apply Faraday's law of induced voltages.
03.34	Solve for mutual inductance in a coupled circuit.
03.35	Use mesh currents, branch currents, nodal, and/or source transformation analysis to analyze circuits.
03.36	Identify the effects of transient spikes in RC, RL, and RLC circuits.
03.37	Identify the effects of loading on transformers.
03.38	Analyze multi source circuits using superposition theorem.
03.39	Analyze circuits using Thevenin's theorem.
03.40	Analyze circuits using Norton's theorem.
03.41	Analyze circuits using maximum power transfer theorem.
03.42	Analyze AC circuits using computer programs.
03.43	Identify three-phase power concepts.
04.0	Demonstrate proficiency in analog electronics–The student will be able to:
04.01	Analyze the construction of various types of P-N junction diodes.
04.02	Construct, analyze, and troubleshoot diode circuits.
04.03	Construct, analyze, and troubleshoot regulator circuits using Zener diodes.
04.04	Construct, analyze, and troubleshoot bipolar junction transistor biased circuits.
04.05	Construct, analyze, and troubleshoot field effect transistor biased circuits.
04.06	Construct, analyze small signal amplifier circuits using bipolar junction or field effect transistors.
04.07	Construct, analyze, and troubleshoot multistage amplifiers.
04.08	Construct, analyze, and troubleshoot power amplifiers.
04.09	Analyze low and high frequency amplifier responses.

04.10	Discuss troubleshooting techniques applied to discrete solid state circuits.
04.11	Discuss performance and applications for discrete solid state circuits.
04.12	Analyze discrete solid-state circuits using computer programs.
04.13	Identify and define operational characteristics and applications of multistage amplifiers.
04.14	Construct, analyze and troubleshoot multistage amplifiers.
04.15	Identify and define operating characteristics and applications of linear integrated circuits.
04.16	Identify and define operating characteristics and applications of unregulated power supplies and filters.
04.17	Construct unregulated power supplies and filters.
04.18	Troubleshoot basic power supplies and filters.
04.19	Identify and define operating characteristics and applications of differential and operational amplifiers.
04.20	Construct differential and operational amplifier circuits.
04.21	Analyze and troubleshoot differential and operational amplifier circuits.
04.22	Identify and define operating characteristics of audio power amplifiers.
04.23	Construct audio power amplifiers.
04.24	Identify and analyze different amplifier classes and their applications.
04.25	Analyze and troubleshoot audio power amplifiers.
04.26	Identify and define operating characteristics and applications of power supply regulator circuits.
04.27	Construct power supply regulator circuits.
04.28	Analyze and troubleshoot power supply regulator circuits.
04.29	Identify and define operating characteristics and applications of active filters.
04.30	Construct active filter circuits.
04.31	Analyze and troubleshoot active filter circuits.
04.32	Identify and define operating characteristics and applications of sinusoidal and non-sinusoidal oscillator circuits.
04.33	Construct oscillator circuits.
04.34	Analyze and troubleshoot oscillator circuits.
04.35	Identify and define operating characteristics and applications of cathode ray tubes.
04.36	Identify and define operating characteristics and applications of optoelectronic devices.
04.37	Construct, analyze, and troubleshoot an operational amplifier circuit.
04.38	Solve problems in heat sinking and power limitations for AF power amplifiers.
04.39	Select the integrated circuit (IC) appropriate to the defined parameters of a circuit.

04.40	Analyze and troubleshoot operational amplifier circuits with negative or positive feedback.
04.41	Analyze the operational amplifier frequency response and compensation circuits.
04.42	Construct, analyze, and troubleshoot basic linear and non-linear amplifier circuits.
04.43	Construct, analyze, and troubleshoot active filters using operational amplifiers.
04.44	Construct, analyze, and troubleshoot oscillator circuits using operational amplifiers.
04.45	Construct and analyze phased lock loop circuits.
04.46	Construct and analyze integrated circuit voltage regulators.
04.47	Understand and describe fundamental modulation/demodulation concepts.
05.0	Demonstrate proficiency in digital electronics–The student will be able to:
05.01	Define and apply numbering systems to codes and arithmetic operations.
05.02	Analyze and minimize logic circuits using Boolean and Karnaugh Map (K-Map) operations.
05.03	Demonstrate proficiency in the use of logic probes for digital circuits.
05.04	Demonstrate proficiency in the use of power supplies for digital circuits.
05.05	Demonstrate proficiency in the use of pulsers for digital circuits.
05.06	Demonstrate proficiency in the use of oscilloscopes for digital circuits.
05.07	Demonstrate proficiency in the use of logic analyzers for digital circuits.
05.08	Demonstrate proficiency in the use of pulse generators for digital circuits.
05.09	Examine power distribution and possible noise problems.
05.10	Identify types of logic gates and their truth tables.
05.11	Construct combinational logic circuits using integrated circuits.
05.12	Troubleshoot logic circuits.
05.13	Analyze types of flip-flops and their truth tables.
05.14	Construct flip-flops using integrated circuits.
05.15	Troubleshoot flip-flops.
05.16	Identify types of logic circuits using integrated circuits.
05.17	Identify types of registers and counters.
05.18	Construct registers and counters using flip-flops and logic gates.
05.19	Troubleshoot registers and counters.
05.20	Analyze clock and timing circuits.
05.21	Construct clock and timing circuits.

	05.22	Troubleshoot clock and timing circuits.
	05.23	Identify types of adder/subtractor logic circuits.
	05.24	Construct adder/subtractor logic circuits.
	05.25	Troubleshoot adder/subtractor logic circuits.
	05.26	Identify types of encoding and decoding devices.
	05.27	Construct encoders and decoders.
	05.28	Troubleshoot encoders and decoders.
	05.29	Identify types of multiplexer and demultiplexer circuits using integrated circuits.
	05.30	Construct multiplexer and demultiplexer circuits using integrated circuits.
	05.31	Troubleshoot multiplexer and demultiplexer circuits.
	05.32	Identify types of memory circuits.
	05.33	Relate the uses of digital-to-analog and analog-to-digital conversions.
	05.34	Construct digital-to-analog and analog-to-digital circuits.
	05.35	Troubleshoot digital-to-analog and analog-to-digital circuits.
	05.36	Identify types of digital displays.
	05.37	Construct digital display circuits.
	05.38	Troubleshoot digital display circuits.
	05.39	Identify and apply programmable logic device (PLD) concepts to logic circuits.
	05.40	Analyze analog and digital circuits using computer programs
	05.41	Define and apply numbering systems to codes and arithmetic operations.
	05.42	Analyze and minimize logic circuits using Boolean and Karnaugh Map (K-Map) operations.
	05.43	Demonstrate proficiency in the use of function generators and oscilloscopes for digital circuits.
	05.44	Identify types of logic gates and their truth tables.
	05.45	Analyze, design, construct, troubleshoot, and verify combinational and sequential logic circuits using integrated circuits, including basic gates, flip-flops, registers, counters, arithmetic logic units, multiplexers/demultiplexers, encoders/decoders, digital displays, analog to digital and digital to analog circuits.
	05.46	Identify and apply very high speed integrated circuit hardware description language (VHDL) and PLD concepts to the design and construction of complex logic circuits.
06.0	Demonstrate proficiency in microcomputers and computer systems architecture–The student will be able to:	
	06.01	Draw the block diagram and describing the basic architecture of a microcomputer.
	06.02	Identify and give functional descriptions of data, address, and control buses.
	06.03	Describe the internal architecture and functional components of a microprocessor/microcontroller.

	06.04	Identify and analyze addressing concepts.
	06.05	Describe the sequence of operations in the execution of a microprocessor/microcontroller instruction.
	06.06	Write, assemble, execute, and debug software instructions and programs including data movement, logical and shifting instructions.
	06.07	Identify the various types of RAM and ROM memories and their interfacing to the microprocessor/microcontroller.
	06.08	Analyze, design, construct, troubleshoot, and verify a microprocessor/microcontroller system, including interrupt driven input/output and Universal Asynchronous Receiver/Transmitters (UART).
	06.09	Analyze and draw a timing diagram showing all pertinent bus signals in a microprocessor/microcontroller system.
07.0	Demonstrate proficiency in software engineering fundamentals–The student will be able to:	
	07.01	Identify, formulate, and solve software engineering problems, including the specification, design, implementation, and testing of software systems that meet specification, performance, maintenance and quality requirements.
	07.02	Describe the software life cycle.
	07.03	Describe software portability and modularity.
	07.04	Demonstrate the use of maintenance and version control.
	07.05	Implement unit testing, validation, and verification.
08.0	Demonstrate proficiency in the analysis and design of data and computer communications systems–The student will be able to:	
	08.01	Analyze, design, construct, troubleshoot, and verify serial and parallel communication systems using industry standard protocols in hardware and software.
	08.02	Identify and define networking and communication layers.
	08.03	Identify and define data communication protocols and networking techniques.
	08.04	Describe the different types of digital data communications systems.
	08.05	Describe data formats and transmission rates in serial data communications systems.
	08.06	Apply digital modulation techniques including pulse-amplitude modulation (PAM), pulse-code modulation (PCM), pulse-width modulation (PWM), and delta modulation.
	08.07	Analyze and design circuits for generation and detection of digital modulation.
	08.08	Apply error detection and correction in digital communication systems.
	08.09	Design and apply multiplexing techniques for computer communications.
09.0	Demonstrate proficiency with high-level computer programming languages, data structures, and operating system principles emphasizing the hardware/software interface–The student will be able to:	
	09.01	Design, implement, compile, and debug technical programs in a high-level unmanaged programming language (e.g. C and C++) using industry standard tools and techniques.
	09.02	Understand, identify, and define basic operating system concepts such as paging, memory management, process synchronization and management, basic operating system structures, threads, single and multi-user systems, and protection/security.
	09.03	Analyze and implement data structures such as linked lists, stacks, queues, trees, hash tables/maps.

	09.04	Understand and apply compilation, debugging, and file manipulation techniques in both POSIX and Microsoft Windows environments.
	09.05	Apply C/C++ syntax to create control structures, apply sorting techniques, use arithmetic operations, create and use pointers, and perform file I/O.
	09.06	Describe and apply industry accepted techniques for solving engineering problems using C or C++, including algorithm development, flowcharting, and creation of dynamic and statically linked libraries.
	09.07	Demonstrate an understanding of the internal representation of data, data types, and operators, including little endian/big endian, and IEEE floating point.
10.0	Demonstrate appropriate communication skills–The student will be able to:	
	10.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.
	10.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.
	10.03	Read and follow written and oral instructions.
	10.04	Answer and ask questions coherently and concisely.
	10.05	Read critically by recognizing assumptions and implications and by evaluating ideas.
11.0	Demonstrate appropriate math skills at or above the level of algebra and trigonometry–The student will be able to:	
	11.01	Demonstrate knowledge of and ability to apply college algebra.
	11.02	Demonstrate knowledge of and ability to apply trigonometry.
	11.03	Demonstrate knowledge of and ability to apply discrete math, probability, and statistics.
12.0	Demonstrate appropriate understanding of the natural sciences–The student will be able to:	
	12.01	Understand and apply the scientific method of inquiry to solve problems.
	12.02	Understand and apply the International System (SI) of units and measurements.
	12.03	Understand and apply the basic principles of physics.
	12.04	Draw conclusions or make inferences from data using statistical data analysis techniques.
13.0	Demonstrate employability skills–The student will be able to:	
	13.01	Conduct a job search and secure information about a job.
	13.02	Identify documents which may be required when applying for a job interview.
	13.03	Complete a job application form correctly.
	13.04	Demonstrate competence in job interview techniques.
	13.05	Demonstrate competence in project management techniques.
	13.06	Identify or demonstrate appropriate responses to criticism from employer, supervisor or other employees.
	13.07	Identify acceptable work habits.
	13.08	An ability to function effectively on teams.

14.0	Demonstrate proficiency in technical recording and reporting–The student will be able to:
14.01	Demonstrate proficiency in the use of microcomputer application programs (i.e. word processor, database, and spreadsheet).
14.02	Demonstrate the use of microcomputer circuit capture and simulation programs.
14.03	Demonstrate the use of microcomputer analytical software.
14.04	Record data including the use of curves and graphs.
14.05	Write reports and make oral presentations.
14.06	Maintain test logs.
14.07	Make equipment failure reports.
15.0	Understand, install, configure and troubleshoot issues relating to computer hardware and software–The student will be able to:
15.01	Describe the functions and major components (BIOS, task management, etc.) of a computer operating system.
15.02	Use an operating system for activities such as data and file management.
15.03	Identify various coding schemes (ASCII, etc.).
15.04	Identify the major hardware platforms.
15.05	Set up and use multiple hardware platforms built on various processor architectures.
15.06	Use system software to perform routine maintenance tasks such as backup, hard drive defragmentation, etc.
15.07	Use both stand-alone operating systems and network operating systems.
15.08	Describe and demonstrate the primary features and functions of the major categories of applications software (word processing, database, spreadsheet, presentation, email, browsers, etc.).
15.09	Describe the functions of major components of a computer system.
15.10	Discuss various computer applications in society.
15.11	Describe the categories of computers.
15.12	Recognize the value of computer literacy within an individual's personal and career environments.
15.13	Set up and configure systems and peripherals.
15.14	Set up and upgrade BIOS.
15.15	Install and configure storage and I/O device interfaces.
15.16	Describe the architecture of a typical microcomputer system.
15.17	Perform component maintenance tasks on microcomputer systems.
15.18	Perform preventive maintenance tasks on microcomputer systems.
15.19	Describe issues that affect system design and construction (redundancy, fault tolerance, etc.).

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Additionally, students will design, build, and test experiments and projects, and equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificate:

Microcomputer Repairer/Installer (0647010406) – 15 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Biotechnology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1626120100
Program Type	College Credit
Standard Length	61 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4021 – Biological Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-one credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-one credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate communication skills.
02.0 Demonstrate safety skills.
03.0 Demonstrate basic laboratory skills.
04.0 Demonstrate regulatory compliance.
05.0 Demonstrate appropriate decision making and problem solving techniques.
06.0 Demonstrate specific laboratory skills.
07.0 Demonstrate quality assurance/control.
08.0 Maintain facility and equipment.
09.0 Demonstrate knowledge and proper care/use of test animals/plants.

Florida Department of Education
Student Performance Standards

Program Title: **Biotechnology**
CIP Numbers: **1626120100**
Program Length: **61 credit hours**
SOC Code(s): **19-4021**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate communication skills--The student will be able to:
01.01	Make professional oral and written presentations.
01.02	Comprehend and use correct technical vocabulary.
01.03	Follow/analyze experimental and lab protocols.
01.04	Keep accurate lab records in notebooks. (hand written and electronically)
01.05	Review and maintain notes on procedures. (hand written and electronically)
01.06	Prepare identify and apply changes to control procedures.
01.07	Write or update manuals, SOP's protocols, reports and technical summaries.
01.08	Perform computerized research and web searches, including, but not limited to Pub Med.
01.09	Read technical literature, including, but not limited to original research articles.
01.10	Identify basic reference resources in biotechnology, including, but not limited to original journal articles.
01.11	Perform basic applications in word processing, spread sheets, databases, presentations and project management.
01.12	Make professional oral and written presentations.
02.0	Demonstrate safety skills--The student will be able to:
02.01	Identify first aid supplies, eye wash station, emergency shower, co-worker contact, medical information, and emergency protection and evacuation plan.
02.02	Follow correct safety procedures, guidelines and chemical hygiene plans.
02.03	Maintain required environmental health & safety, and lab animal training.
02.04	Maintain a safe, uncluttered and clean work area.
02.05	Maintain and utilize safety equipment and personal protection equipment.
02.06	Check expiration dates, lot numbers and labels for chemical and hazardous substances.
02.07	Monitor usage and exposure to hazardous materials, and keep appropriate usage logs.

	02.08	Handle, store and dispose of waste and hazardous materials per SDS, other safety guidelines and Worker Protection Standards (WPS).
	02.09	Follow universal precautions for biological pathogens, both proper handling and disposal.
	02.10	Store and label chemicals and biologicals according to industry recognized storage guidelines.
03.0	Demonstrate basic laboratory skills--The student will be able to:	
	03.01	Obtain and read protocol, test procedure, standard operating procedure (SOP), equipment manuals, and proper forms.
	03.02	Prioritize and perform multiple tasks in a timely manner, based upon priorities communicated by supervisor.
	03.03	Clean, organize and sterilize materials and lab instruments, when required.
	03.04	Check and maintain equipment, logs and perform preventative maintenance tasks according to schedule.
	03.05	Order inventory of supplies; date/label reagents. Store promptly upon arrival.
	03.06	Practice aseptic technique.
	03.07	Use titration/pipetting techniques; measure volume/weights precisely.
	03.08	Perform basic calculations and statistical analysis using appropriate software.
	03.09	Calculate and prepare dilutions series.
	03.10	Prepare solutions and reagents for laboratory use.
	03.11	Monitor physical properties of reagents, buffers, media and solutions and determine optimum conditions for use.
	03.12	Obtain and review appropriate procedures and test forms, prepare for lab inspections and respond to the reports.
	03.13	Collect and set up samples for analysis.
	03.14	Set up general laboratory tests, including, setup equipment and perform/document tests and results.
	03.15	Operate laboratory equipment and instrumentation after familiarization with manuals and or training, which may include the following, but not limited to: Thermocycler, microscopes, fluorimeter, hoods, centrifuge, polarimeter, pH meter, chart recorder, stirrers, balance, conductivity meter, mixers, autoclave, power supply, shakers, dry heat ovens, incubator, Bunsen burner, scintillation counter, high pressure liquid chromatography, gas chromatography/mass spectrometry.
04.0	Demonstrate regulatory compliance--The student will be able to:	
	04.01	Follow guidelines from the appropriate regulatory, accreditation, and/or certification agencies, such as FDA, OSHA, USDA, NIH, NR, DOT, EPA, CDC, ISO/IEC and NRC.
	04.02	Accept and follow state, local and industry regulations.
	04.03	Perform manufacturing processes using current continuous quality improvement practices.
05.0	Demonstrate appropriate decision making and problem solving techniques--The student will be able to:	
	05.01	Identify decision to be made, compare alternatives, and discuss alternatives with supervisor.
	05.02	Apply decision making skills in the workplace.
	05.03	Make decisions based on accurate facts, data, and agreed-upon goals.

	05.04	Evaluate the decision made quantitatively and qualitatively.
	05.05	Apply problem solving techniques in the workplace.
	05.06	Diagnose problem, its urgency and causes, and documenting as appropriate.
	05.07	Compare and contrast advantages/disadvantages for solutions to a problem.
	05.08	Determine appropriate action; implement it and evaluate results.
06.0	Demonstrate specific laboratory skills--The student will be able to:	
	06.01	Identify and quantify microorganisms and cells using manual and automated systems.
	06.02	Isolate, maintain and store pure cell cultures using incubators.
	06.03	Prepare seed inoculum.
	06.04	Harvest cells and recover effluent products.
	06.05	Transform cells.
	06.06	Perform bioassays.
	06.07	Decontaminate and/or dispose of equipment, glassware, biologicals.
	06.08	Perform microbiology skills, which may include but are not limited to, plating techniques, isolating and characterizing cell lines, propagating cell lines, and cryogenic techniques.
	06.09	Apply cell biology and anatomical/histological, which may include but are not limited to, transfection techniques, monoclonal and polyclonal antibodies, and hemagglutination/hemadsorption techniques.
	06.10	Perform immunological techniques, which may include but are not limited to, enzyme-linked immunoabsorbent assays, probe and analyze DNA library, transformation techniques, polymerase chain reaction, translation assays, and construct recombinant vectors.
	06.11	Perform genetic engineering and molecular biology techniques, which may include but are not limited to, isolate and analyze nucleic acid isolation, non-isotope techniques, disrupt cells, protein gels, Western blotting, denature, renature proteins, precipitate soluble proteins, concentrate(filter and dialyze) proteins, quantitative proteins, and enzyme activity assays.
	06.12	Perform additional specific skills, which may include but are not limited to transcribing DNA, electrophoresis on RNA, DNA and proteins, and nucleic acid hybridization.
	06.13	Separate, isolate or characterize proteins, which may include but are not limited to, monitoring protein stability, quantitative analysis and distillation techniques, titration techniques, employing dyes and indicators, lypholization and organic chemistry techniques, and perform extractions.
	06.14	Perform chemical and physical assays including measuring turbidity, viscosity, and density.
07.0	Demonstrate quality assurance/control--The student will be able to:	
	07.01	Perform quality tests and document results.
	07.02	Verify test standards and maintain QA records.
	07.03	Archive samples and documents.
	07.04	Inspect and verify integrity of product, procedure, and specimen.
	07.05	Release final product and perform trend analysis.

	07.06 Investigate complaints and take corrective action.
08.0	Maintain facility and equipment--The student will be able to:
	08.01 Monitor/record the environmental condition of the facility (growth chamber, laboratory, greenhouse, seed storage room, animal room or manufacturing site).
	08.02 Notify appropriate personnel if sampling indicates a problem.
	08.03 Clean work area according to SOPs.
	08.04 Label equipment.
	08.05 Check calibration and perform systems diagnostics
	08.06 Perform or schedule preventive maintenance.
	08.07 Maintain equipment logs.
09.0	Demonstrate knowledge and proper care/use of test animals/plants--The student will be able to:
	09.01 Receive and transport animals.
	09.02 Maintain separate in-process, quarantine and release areas.
	09.03 Feed, water and monitor animals, including separating males/females.
	09.04 Prepare animal food and prescription diets.
	09.05 Clean housing and sterilize cages.
	09.06 Monitor animal health and keep health records.
	09.07 Follow USDA/IACUC guidelines for animal use and care.
	09.08 Properly restrain and handle animals.
	09.09 Collect and process specimens; collect data and analyze document results.
	09.10 Maintain plants for optimal growth.
	09.11 Apply agrochemical safely.
	09.12 Maintain and monitor insect populations.
	09.13 Maintain plant growth media.
	09.14 Inoculate plant and/or soil with biological materials.
	09.15 Gather pollen and bundle pollinate.
	09.16 Apply plant pests safely.
	09.17 Collect data, perform bioassays, and document results of test plants.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Biotechnology Specialist (0626120101) – 19 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Chemical Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1641030100
Program Type	College Credit
Standard Length	64 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4031 – Chemical Technicians
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and a combination of theory and laboratory activities to gain the necessary cognitive and manipulative skills to perform preventive and corrective maintenance, engineering support, and maintain product quality.

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 sixty-four credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty-four credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Demonstrate appropriate written and oral communication skills.
02.0 Demonstrate appropriate mathematical skills to solve basic problems in the sciences.
03.0 Demonstrate appropriate interpersonal skills, decision-making strategies, and awareness of self-worth, ethics and values.
04.0 Demonstrate computer competence.
05.0 Demonstrate basic knowledge of scientific concepts.
06.0 Demonstrate basic knowledge of chemical concepts.
07.0 Demonstrate knowledge of chemical kinetics and thermodynamics.
08.0 Demonstrate skills in handling chemical materials and equipment.
09.0 Demonstrate conceptual and laboratory knowledge in the area of organic chemistry and/or physics and/or biology and/or engineering and/or biotechnology and/or chemical instrumentation.
10.0 Exercise safety in the laboratory and adhere to safety, health and environmental regulations.

Florida Department of Education
Student Performance Standards

Program Title: **Chemical Technology**
CIP Numbers: **1641030100**
Program Length: **64 credit hours**
SOC Code(s): **19-4031**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Demonstrate appropriate communication skills--The student will be able to:
01.01	Write logical and understandable sentences and paragraphs.
01.02	Carefully read, accurately follow, and demonstrate understanding of written instructions and procedures.
01.03	Read critically by recognizing assumptions and implications and by evaluating ideas.
01.04	Carefully follow and deliver oral instructions and other spoken information related to the workplace.
01.05	Prepare, outline, and deliver a short oral presentation.
01.06	Participate in group discussion as a member and as a leader.
01.07	Prepare visual material to support an oral presentation.
01.08	Answer and ask questions coherently and concisely.
01.09	Give clear, concise instructions.
01.10	Read technical manuals, reports and journals.
01.11	Read and prepare diagrams and charts.
01.12	Maintain logs and notes.
01.13	Keep records.
01.14	Maintain an accurate notebook.
01.15	Report data.
01.16	Write methods.
01.17	Write memos and letters.
02.0	Demonstrate appropriate mathematical skills to solve basic problems in the sciences--The student will be able to:
02.01	Calculate ratios.
02.02	Perform unit conversions.

	02.03 Perform calculations using exponents and exponential functions
	02.04 Perform calculations using logarithms and logarithmic functions.
	02.05 Use appropriate significant figures.
	02.06 Recognize patterns from data.
	02.07 Solve single-unknown algebraic equations.
	02.08 Read and construct graphs.
	02.09 Calculate slopes and intercepts of linear graphs.
	02.10 Perform calculations using roots.
	02.11 Solve Simultaneous equations.
	02.12 Solve quadratic equations.
	02.13 Solve chemical and other word problems using arithmetic and algebra.
03.0	Demonstrate appropriate interpersonal skills, decision-making strategies, and awareness of self-worth, ethics and values--The student will be able to:
	03.01 Discuss the importance of teamwork and have experience working as a member of a team for planning, performing, analyzing, and reporting.
	03.02 Demonstrate critical thinking skills.
	03.03 Demonstrate high ethical standards in all aspects of work.
	03.04 Apply quality principles to all aspects of work.
	03.05 Develop appropriate interpersonal skills.
	03.06 Recognize sources and symptoms of stress and learn how to manage one's response to it.
	03.07 Demonstrate the ability to compete effectively in the job market.
	03.08 Determine the importance of initiative and responsibility and examine the possible repercussions of action vs. non-action.
	03.09 Demonstrate the ability to problem solve effectively and resolve typical workplace conflicts.
	03.10 Apply decision-making strategies to workplace situations.
	03.11 Explain the basis for employer expectations: the written and unwritten "rules for success."
	03.12 Interpret the meaning of loyalty and commitment to the organization.
	03.13 Recognize the "culture" of an organization or employer and evaluate its impact on the individual.
	03.14 Develop an awareness of diversity and multi-culturalism.
04.0	Demonstrate computer competence--The student will be able to:
	04.01 Use a computer keyboard.
	04.02 Discuss fundamental computer and networking concepts.

04.03	Use word processing software.
04.04	Use graphics software.
04.05	Access database information.
04.06	Maintain a database.
04.07	Use, maintain, and develop spreadsheets.
04.08	Use statistical software.
05.0	Demonstrate basic knowledge of scientific concepts--The student will be able to:
05.01	Discuss the scientific method.
05.02	Understand the need to organize and classify natural phenomena.
05.03	Discuss relationships between characteristics of natural phenomena.
05.04	Dissect a natural system into its component parts
05.05	Model natural phenomena.
05.06	Understand that nature behaves in predictable ways.
05.07	Discuss methods of observing natural changes, from extremely slow changes to extremely fast changes.
05.08	Discuss the variation in the scale of naturally occurring phenomena
05.09	Discuss the diversity found within classes of natural organisms
06.0	Demonstrate basic knowledge of chemical concepts--The student will be able to:
06.01	Write chemical formulas and use correct chemical nomenclature for inorganic compounds.
06.02	Classify inorganic compounds according to a variety of chemical and physical properties.
06.03	Name and write the symbols for the elements and describe characteristics of the common groupings of elements.
06.04	Describe the basic reactions that occur between commonly used chemical substances.
06.05	Read, write, balance and interpret chemical equations.
06.06	Solve a variety of basic chemical problems using equations and/or dimensional analysis.
06.07	Classify chemicals according to reactivity.
06.08	Identify incompatible combinations of chemicals that could result in potentially dangerous situations.
06.09	Solve a variety of problems dealing with chemical composition and stoichiometry.
06.10	Know and apply empirical gas laws and theory relating to the behavior of gases.
06.11	Demonstrate a basic understanding of energy as it relates to chemical and other processes.
06.12	Demonstrate a basic understanding of the laws and theories relating to the structure of the atom and how this relates to the Periodic Table.
06.13	Demonstrate a basic understanding of molecular structure and chemical bonding,

	06.14 Describe the structure and properties of liquids and solids.
	06.15 Describe solutions and their properties, and perform calculations involving solution composition and colligative properties.
07.0	Demonstrate knowledge of chemical kinetics and thermodynamics--The student will be able to:
	07.01 Demonstrate a basic understanding of chemical kinetics
	07.02 Demonstrate a basic understanding of chemical equilibria.
	07.03 Demonstrate a working knowledge of acid/base equilibria.
	07.04 Demonstrate a working knowledge of precipitation equilibria,
	07.05 Demonstrate a working knowledge of redox chemistry.
	07.06 Use the concepts of heat, work, energy, enthalpy, entropy and Gibbs Free Energy to discuss how energetics and change are interrelated in chemical processes and solve related problems.
	07.07 Demonstrate a basic knowledge of radioactivity.
08.0	Demonstrate skills in handling chemical materials and equipment--The student will be able to:
	08.01 Properly identify and use a variety of common chemistry laboratory glassware.
	08.02 Use common chemistry laboratory equipment to include such items as hot plates, stirrers, laboratory balances and centrifuges.
	08.03 Preparing solutions of specific concentration from pure substances
	08.04 Performing dilutions to prepare solution of specific concentration
	08.05 Purify chemicals using techniques such as filtering, extracting, crystallization, precipitation, distilling, etc.
	08.06 Use basic analytical chemistry procedures and concepts of measurements in volumetric, gravimetric, and electrochemical analyses and correctly perform associated calculations.
	08.07 Prepare samples for analysis, including digesting, ashing, dissolving, grinding, purifying, diluting, and chemically altering as appropriate before analysis.
	08.08 Determine pH using both wet and instrumental methods.
	08.09 Calculate molarity, molality, mole fraction, weight percent, and normality of solutions, given the appropriate information.
	08.10 Conduct analytical tests using acid-base, oxidation-reduction, and complexometric titrations.
	08.11 Perform gravimetric, volumetric, and electrochemical analyses and achieve results within acceptable limits of precision and accuracy.
	08.12 Apply statistical methods of data treatment.
09.0	Demonstrate conceptual and laboratory knowledge in the area of organic chemistry and/or analytical chemistry and/or physics and/or biology and/or engineering and/or biotechnology and/or chemical instrumentation--Students will be competent in two or more of the following areas of specialization:
Specialty I: Organic Chemistry--The student will be able to:	
	09.01 Draw Lewis structures, deduce atomic orbital hybridizations and describe molecular shapes for organic structures.

09.02	Classify organic reactions in common groups, write chemical equations and describe unique features for each type.
09.03	Describe, name, and give common reactions of alkanes, alkenes, and alkynes.
09.04	Describe, name, and give common reactions of alcohols, ethers, and halides.
09.05	Describe, name, and give common reactions of aldehydes and ketones.
09.06	Describe, name, and give common reactions of carboxylic acids and esters.
09.07	Describe, name, and give common reactions of amines and amides.
09.08	Describe and name simple carbohydrates, simple lipids, and amino acids.
09.09	Describe the basic concepts of proteins and their structure.
09.10	Describe the basic concepts of polymerization reactions.
09.11	Apply concepts of chemical reactivity, kinetics, stoichiometry, and equilibrium to chemical syntheses and analyses.
09.12	Crystallize, evaporate, sublime, extract, and use phase separations and/or other purification and separation techniques.
09.13	Perform organic chemical reactions using glassware and techniques typically employed in organic chemistry laboratories (e.g. ‘quick fir glassware, anhydrous conditions etc)
09.14	Determine reaction yields using chemical stoichiometry.
09.15	Use chemical and instrumental techniques to determine the structure of organic materials.
Specialty II: Physics--The student will be able to:	
09.16	Solve physical problems dealing with mass, distance, area, volume, relative position, motion, velocity, kinetic and potential energy, momentum, force, acceleration, heat, sound and related concepts.
09.17	Use analytical reasoning in solving problems dealing with a variety of physical quantities and phenomena.
09.18	Use basic concepts and terminology from physics and related applications as found in the industrial workplace.
09.19	Use basic laboratory instruments for determining length, mass, time, temperature and other easily measurable physical quantities.
09.20	Collect and manipulate numerical data in controlled experiments involving physical parameters and use these data to discover the mathematical functions by which the variables are related.
09.21	Analyze physical behavior and know how to properly apply principles of physics related to basic mechanics and sound.
09.22	Characterize physical properties of gases, liquids, and solids and describe their reactions to changes of temperature and pressure.
09.23	Choose the appropriate equipment for measuring physical properties based on specified accuracy and precision requirements.
09.24	Solve physical problems dealing with basic concepts in electricity, magnetism, light, optics and thermodynamics.
09.25	Analyze physical behavior and know how to properly apply principles of physics related to basic electricity, magnetism, light, optics and thermodynamics.
Specialty III: Biology--The student will be able to:	

09.26	Name the components of the cell theory and relate each to basic concepts of life.
09.27	Given a list of structural characteristics and components, relate them to the correct cell structure. Given a list of cellular activities or characteristics, relate them to the correct cell structure.
09.28	Explain and interpret the role of mutations, natural selection and its basic components as they relate to biological evolution.
09.29	Know why energy is limited in amount. Know and be able to explain the consequences of energy in terms of its availability to living organisms, both now and in the future. Know how it is used and transferred through food chains.
09.30	Explain how sunlight is trapped as an energy source and how this trapped energy is used to synthesize simple organic molecules. Describe the basic role or activity of chloroplasts and chlorophyll, cyclic and non-cyclic photophosphorylation, carbon dioxide reduction and fixation.
09.31	Describe the sequential events of mitosis.
09.32	Describe the sequential events of meiosis.
09.33	Solve and interpret various genetics problems involving Mendelian principles.
09.34	List and describe ways and give examples of how man has altered his environment, both positively and negatively, and be able to detail some of the consequences of this action.
09.35	Give the basic characteristics of the carbon, nitrogen, and hydrological cycles.
09.36	Describe the effects of the increasing human population upon natural resources use and depletion, degradation of the environment, social and economic problems both within nations and between nations, etc.
09.37	State the basic morphologic types of Eubacteria.
09.38	Diagram and describe the structural components of bacterial cells.
09.39	Distinguish gram positive cells and gram negative cells from a description of cell wall chemical components.
09.40	Successfully demonstrate the correct staining procedure for general staining, acidfast staining, spore staining, capsular staining and flagellar staining.
09.41	Describe the characteristics that identify by form yeasts, rickettsias, PPLs, viruses and molds, and show how they are distinguished from other organisms or types of bacteria.
09.42	List the factors determining colonial growth.
Specialty IV: Engineering--The student will be able to:	
09.43	Utilize vectors to solve engineering problems.
09.44	Utilize calculus to solve engineering problems
09.45	Analyze particles and rigid bodies in equilibrium.
09.46	Analyze situations where a force causes a rigid body to rotate.
09.47	Characterize the static and rotational properties of irregular shaped rigid bodies.
09.48	Analyze the distribution of forces and moments within a structural member.
09.49	Analyze the equilibrium of rigid bodies subjected to dry friction.

09.50	Analyze the motion of particles.
09.51	Analyze the kinetics of particles using Newton's Second Law, the methods of work and energy and the methods of impulse and momentum.
09.52	Analyze the kinetics of a system of particles.
09.53	Analyze the motion of rigid bodies.
09.54	Analyze the effect of forces on rigid bodies in two dimensions.
09.55	Analyze the kinetics of rigid bodies using the methods of work, energy, impulse, and momentum in two dimensions.
09.56	Produce accurate diagrams of two and three dimensional objects using a design and drafting software package.
09.57	Solve mathematical problems using software packages such as: Excel, MathCAD and MATLAB.
09.58	Acquire the team building skills typically found in the engineering profession.
Specialty V: Biotechnology--The student will be able to:	
09.59	Demonstrate an understanding of the operating principle, safety features and uses of the following equipment used in a biotechnology laboratory.
09.60	Demonstrate an understanding the importance of a sterile working environment and proper aseptic techniques for culturing bacterial.
09.61	Demonstrate an understanding of the operating principle, safety features and use of common bioseparation techniques
09.62	Demonstrate an understanding of the methodologies required for creating recombinant DNA encompassing.
09.63	Demonstrate an understanding of the science and scientific basis of biotechnology including traditional methodologies, fermentation and industrial microbiology.
09.64	Demonstrate a basic understanding of the concept of bioethics, safety concerns of bioengineered products and the licensing and patenting process for biotechnology products.
09.65	Implement proper aseptic techniques and disposal procedures for potentially biohazardous materials.
09.66	Operate equipment typically found in a biotechnology laboratory safely.
09.67	Prepare samples of RNA/DNA for microinjection as guided by Standard Operating Procedures, create transgenic organisms, and interpret effectiveness of technique.
Specialty VI: Chemical Instrumentation--The student will be able to:	
09.68	Describe the basic scientific principles behind a variety of instrumental methods used in a modern chemical laboratory such as atomic spectroscopy, molecular spectroscopy, chromatography, and X-ray techniques.
09.69	Describe the major components of each instrumental method studied and the role that each component plays in making the chemical measurement.
09.70	Gain hands-on experience in the operation of instruments locally available.
09.71	Gain experience in the application of each instrumental method to the solution of specific kinds of chemical analysis problems encountered in the industrial laboratory.

	09.72	Choose an instrument appropriate for a given analysis and know the limitations of the instrument.
	09.73	Properly prepare samples and properly calibrate each instrument.
	09.74	Use proper safety precautions for all instruments.
	09.75	Adjust instrument settings to handle varied chemical samples under a variety of conditions.
	09.76	Describe the basic concepts of chemical/physical separation techniques and apply separation techniques to the analysis of materials.
	09.77	Choose appropriate sample preparation techniques for physical characterization measurements and/or analysis of structure, concentration, and composition.
	09.78	Interpret and use schematic and/or electronic diagrams and drawings describing instruments.
	09.79	Apply basic knowledge of organic and inorganic chemistry, including nomenclature, classification in chemical groups, chemical and physical characteristics and chemical reactivity to instrumental analysis.
10.0	Exercise safety in the laboratory and adhere to safety, health and environmental regulations--The student will be able to:	
	10.01	Be aware of and follow federal, state, and local legislation pertaining to safety, health, and environmental regulations.
	10.02	Recognize that each company has policies and safety plans that include evacuation procedures, emergency numbers, rules, and practices.
	10.03	Demonstrate familiarity with "Right to Know" legislation and how it applies to chemical laboratory technicians.
	10.04	Recognize, apply, and respond appropriately to the hazard symbols and toxicology sections of MSDSs.
	10.05	Choose the proper safety equipment for conducting a variety of laboratory tasks (e.g., proper hoods, shields).
	10.06	Choose and demonstrate the use of personal protective equipment to be used in a variety of situations (e.g., eye wear, special clothing).
	10.07	Demonstrate safe handling procedures (e.g., handling cylinders, glassware, laboratory instruments).
	10.08	Describe the various categories of hazardous materials.
	10.09	State the considerations which must be examined when storing chemicals.
	10.10	Make informed and appropriate decisions on how and where to store chemical materials to minimize hazards.
	10.11	Given a material safety data sheet, explain each section of the sheet.
	10.12	Define and give an example of the major physical and health hazards which are likely to be encountered in the industrial laboratory.
	10.13	List the information needed on each hazardous material when conducting an inventory.
	10.14	Demonstrate the human health effects associated with exposure to hazardous materials.
	10.15	Exercise appropriate precautions in handling hazardous chemicals, contaminated materials, hot objects, sharp objects, etc.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Certificate Programs

A College Credit Certificate consists of a program of instruction of less than sixty (60) credits of college-level courses, which is part of an AS or AAS degree program and prepares students for entry into employment (Rule 6A-14.030, F.A.C.). This AS degree program includes the following College Credit Certificates:

Chemical Laboratory Specialist (0641030101) – 37 credit hours
Scientific Workplace Preparation (0641030102) – 26 credit hours

Standards for the above certificate programs are contained in separate curriculum frameworks.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Industrial Management Technology**
Career Cluster: **Manufacturing**

AS	
CIP Number	1652020501
Program Type	College Credit
Standard Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	11-1021 – General and Operations Managers
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, principles of management, personnel management, and general business procedures.

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 sixty credit hours.

Program Length

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. The standard length of this program is sixty credit hours according to Rule 6A-14.030, F.A.C.

Standards

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

01.0 Apply supervision skills.
02.0 Communicate effectively in supervision.
03.0 Manage human behavior.
04.0 Motivate one's self.
05.0 Motivate others.
06.0 Apply strategies for effective management.
07.0 Employ creative thinking to achieve business objectives.
08.0 Apply basic decision-making skills in supervision.
09.0 Demonstrate appropriate communication skills.
10.0 Demonstrate appropriate math skills.
11.0 Demonstrate an understanding of entrepreneurship.
12.0 Demonstrate knowledge of data-processing activities.
13.0 Identify, classify, and demonstrate management functions.
14.0 Develop human relations skills.
15.0 Apply basic quality control principles.
16.0 Demonstrate an understanding of technical or industrial competencies.

Florida Department of Education
Student Performance Standards

Program Title: **Industrial Management Technology**
CIP Numbers: **1652020501**
Program Length: **60 credit hours**
SOC Code(s): **11-1021**

The AS degree requires the inclusion of a minimum of 15 credits of general education coursework according to SACS, and it must be transferable according to Rule 6A-14.030 (2), F.A.C. At the completion of this program, the student will be able to:	
01.0	Apply supervision skills--The student should be able to:
01.01	Specify the responsibilities of the supervisor.
01.02	Implement human relations skills.
01.03	Follow leadership principles and approaches.
01.04	Apply positive approaches to discipline.
01.05	Conceptualize organizational functions of management.
01.06	Develop organizational plans.
01.07	Follow and teach accepted accident prevention practices.
01.08	Apply the principles and procedures of delegation.
01.09	Utilize motivational skills to coordinate employee and organization interest.
01.10	Apply appropriate techniques of dealing with crises.
01.11	Utilize strategies for dealing with interpersonal conflicts.
01.12	Analyze causes of resistance in employees.
01.13	Implement the agreement-finding process.
01.14	Develop and implement job instructions.
01.15	Apply principles of management to employee/employer conflicts.
02.0	Communicate effectively in supervision--The student should be able to:
02.01	Solve problems in communicating.
02.02	Exhibit appropriate habits in person-to-person communication.
02.03	Apply listening skills.
02.04	Use communication feedback effectively.

	02.05 Use persuasion skills in communicating.
	02.06 Build credibility in management.
	02.07 Recognize and react to non-verbal communication.
	02.08 Practice conflict management skills.
	02.09 Write an effective memorandum.
	02.10 Prepare a written technical report.
	02.11 Apply verbal and non-verbal inter-cultural communication skills.
03.0	Manage human behavior--The student should be able to:
	03.01 Use behavior modification techniques.
	03.02 Establish goals and objectives.
	03.03 Identify and address emotional disturbances of workers.
	03.04 Use self-concept building skills.
	03.05 Assess worker and supervisor roles and relationships.
	03.06 Manage worker resistance to change.
	03.07 Diagnose the dynamics involved in performance appraisal.
	03.08 Explore and research latest issues regarding Americans with Disabilities Act (ADA).
04.0	Motivate one's self--The student should be able to:
	04.01 Build an improved attitude and level of self-confidence.
	04.02 Conceptualize cause-and-effect relationship.
	04.03 Set personal goals.
	04.04 Apply self-discipline techniques.
	04.05 Determine areas of personal talent and potential for personal growth.
05.0	Motivate others--The student should be able to:
	05.01 Conceptualize the self-fulfilling prophecy.
	05.02 Conceptualize the process of motivation.
	05.03 Apply the hierarchy of human needs to worker motivation.
	05.04 Effect job enrichment procedures.
	05.05 Apply attitude-enrichment procedures.
	05.06 Conceptualize concept of maintainers and motivators.
	05.07 Develop role of trust and credibility in worker motivation.

	05.08 Direct goal-setting procedures with workers.
	05.09 Implement participative style of supervision.
06.0	Apply strategies for effective management--The student should be able to:
	06.01 Diagnose unacceptable performance.
	06.02 Determine effective discipline procedures.
	06.03 Undertake disciplinary action.
	06.04 Plan appraisal interviews.
	06.05 Conduct appraisal interviews.
	06.06 Implement transfer, demotion, and termination procedures.
	06.07 Conduct hiring interviews.
	06.08 Implement recruitment procedures.
07.0	Employ creative thinking to achieve business objectives--The student should be able to:
	07.01 Utilize techniques for maximum production of ideas.
	07.02 Establish and maintain conditions necessary for creative problem solving.
	07.03 Diagnose conditions antithetical to creativity.
	07.04 Oversee problem solving.
08.0	Apply basic decision-making skills in supervision--The student should be able to:
	08.01 Conduct decision-making meetings.
	08.02 Employ steps of effective decision-making.
	08.03 Maintain conditions for effective decision-making.
	08.04 Set goals and objectives.
	08.05 Evaluate job applicants.
	08.06 Select the best approach to discipline an employee.
	08.07 Select tasks to delegate.
	08.08 Discuss the performance appraisal with an employee.
	08.09 Select employees for promotion.
09.0	Demonstrate appropriate communication skills--The student should be able to:
	09.01 Write logical and understandable statements to accurately complete forms/invoices commonly used in business and industry, both domestically and internationally.
	09.02 Read and understand graphs, charts, diagrams, and tables commonly used in the industrial/occupational area.
	09.03 Read and follow both written and oral instructions.

	09.04 Answer and ask questions coherently and concisely.
	09.05 Read critically by recognizing assumptions and implications and by evaluating ideas.
	09.06 Utilize appropriate communication skills using telephone, computer or other electronic media, both domestically and internationally.
10.0	Demonstrate appropriate math skills--The student should be able to:
	10.01 Solve problems for volume, weight, area, circumference, and perimeter measurements for rectangles, squares, and cylinders.
	10.02 Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet, and inches.
	10.03 Add, subtract, multiply, and divide using fractions, decimals, and whole numbers.
	10.04 Determine the correct purchase price, including sales tax, for a materials list containing a minimum of six items.
	10.05 Demonstrate an understanding of federal, state, and local taxes and their computation.
11.0	Demonstrate an understanding of entrepreneurship--The student should be able to:
	11.01 Identify characteristics of the American enterprise system.
	11.02 Define inflation and deflation.
	11.03 Identify characteristics of international and global enterprise systems.
	11.04 Determine the results of a change in demand or a change in supply.
	11.05 List factors that contribute to economic growth.
	11.06 Identify characteristics of different types of business ownership.
	11.07 Choose appropriate action in a situation requiring application of business ethics.
12.0	Demonstrate knowledge of data-processing activities--The student should be able to:
	12.01 Identify terms commonly used in information processing.
	12.02 Identify automated business systems, equipment components, and media.
	12.03 Sequence and define the six steps of a procession cycle.
	12.04 Interpret operations of a flowchart of a simulated business job.
	12.05 Check printout for errors, correct, and resubmit.
	12.06 Use an alphanumeric keyboard and a ten-key numeric pad with appropriate techniques.
13.0	Identify, classify, and demonstrate management functions--The student should be able to:
	13.01 Identify the correct definition of management.
	13.02 Identify management positions and styles.
	13.03 Identify the major functions of management.
	13.04 Classify activities as part of the planning function of management.
	13.05 Classify activities as part of the organizing function of management.
	13.06 Classify activities as part of the staffing function of management.
	13.07 Classify activities as part of the directing function of management.

	13.08 Classify activities as part of the controlling function of management.
	13.09 Distinguish the differences among management functions.
	13.10 Select the most effective communication systems.
14.0	Develop human relations skills--The student should be able to:
	14.01 Demonstrate appropriate work habits.
	14.02 Identify behavior that promotes cooperative human relations.
	14.03 Demonstrate time management skills.
15.0	Apply basic quality control principles--The student should be able to:
	15.01 Interpret basic statistical process control charts.
	15.02 Apply basic statistical process control principles.
	15.03 Analyze workers' and inspectors' roles in quality production.
	15.04 Conduct a quality circle work session.
16.0	Demonstrate an understanding of technical or industrial competencies--The student should be able to:
	16.01 Demonstrate an understanding of technical or industrial competencies as specified in the curriculum frameworks of any postsecondary adult or postsecondary vocational program.

Additional Information

Laboratory Activities

Laboratory activities are an integral part of this program. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

Articulation

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 articulation agreements with each other.

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Practical, Technical and Industrial Occupations**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8700300
CIP Number	06469999PA
Grade Level	9-12, 30, 31
Standard Length	1 credit
Teacher Certification	See individual course frameworks.
CTSO	SkillsUSA
SOC Codes (all applicable)	Varied
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to an overview of the subject trade occupational concepts of occupations within that cluster, to include realistic knowledge and expectations of the work environment, career potential, requirement for and extent of basic skills (math, science, and communications), employability skills, job skills, interpretation of technical documentation, job safety and the proper utilization of hand and power tools. Hands-on projects pertinent to the studied occupations must be included to reinforce the study of related materials and processes.

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Practical, Technical and Industrial Occupations industry; planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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

Program Structure

Program requirements may be met by completing one (1) of the practical courses.

Course Number	Course Title	Length	SOC Code
8700310	Practical Appliance Service	1 credit	Varied
8700320	Practical Engine Mechanics	1 credit	Varied
8700330	Practical Construction Trades	1 credit	Varied
8700340	Practical Electrical/Electronics	1 credit	Varied
8700350	Practical Metal Work	1 credit	Varied
8700360	Practical Commercial Foods	1 credit	Varied
8700370	Practical Graphic Arts	1 credit	Varied
8700380	Practical Drafting	1 credit	Varied
8700390	Practical Aviation Careers	1 credit	Varied

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Practical Appliance Service	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Engine Mechanics	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Construction Trades	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Practical Electrical/Electronics	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Metal Work	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Commercial Foods	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Graphic Arts	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Drafting	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Practical Aviation Careers	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
04.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
05.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
06.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.
07.0 Demonstrate realistic knowledge of occupations, skills, and work environment within the occupational cluster associated with the course title of enrollment.
08.0 Demonstrate acceptable professional and personal sanitation practices.
09.0 Demonstrate safe working practices.
10.0 Demonstrate equipment operation skills.
11.0 Produce and interpret pertinent technical documentation.
12.0 Use units and measurements relating to subject occupations.
13.0 Construct projects or complete tasks.
14.0 Identify pertinent materials and processes.
15.0 Demonstrate appropriate communication skills.
16.0 Demonstrate appropriate math skills.
17.0 Demonstrate an understanding of appropriate basic science.
18.0 Demonstrate employability skills in a laboratory environment.
19.0 Demonstrate an understanding of entrepreneurship.
20.0 Research employment and training opportunities and career potential.
21.0 Demonstrate team skills.

2014 – 2015

Florida Department of Education
Student Performance Standards

Course Title: **Practical Appliance Service**
Course Number: **8700310**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards	Correlation to CTE Program Standard #
05.04 Range of Writing	
05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
06.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
06.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
06.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
06.04 Model with mathematics. MAFS.K12.MP.4.1	
06.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
06.06 Attend to precision. MAFS.K12.MP.6.1	
06.07 Look for and make use of structure. MAFS.K12.MP.7.1	
06.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.0 Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:		
07.01 Identify four service trades occupations.		
07.02 Relate the types of duties required of workers in each of four service trades areas.		
07.03 Describe the working conditions of workers in each of four service trades areas.		
08.0 Demonstrate acceptable professional and personal sanitation practices--The student will be		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to the service trades.		
	10.03 Following safety rules established for power equipment.		
	10.04 Safely use power equipment common to the service trades areas.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Interpret various drawings and diagrams common to the service trades areas.		
	11.02 Use service manuals to match diagrams with given equipment needing repairs.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Identify common service trades measurement tools.		
	12.02 Use measuring tools for a job specific to one of the service trades areas.		
	12.03 Use precision measuring tools common to one of the service trades.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Complete an assigned task in appliance repair.		
	13.02 Complete an assigned task in customer relations.		
	13.03 Complete an assigned task in another service trade area.		
14.0	Identify pertinent materials and processes--The student will be able to:		
	14.01 Identify by name given service trades materials.		
	14.02 Identify the uses of given service trades materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.04	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		
18.10	Adapt to change.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the service trades.		
20.02	List 3 different local service trades job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more service trades.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Engine Mechanics**
Course Number: **8700320**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards			Correlation to CTE Program Standard #
	05.04	Range of Writing	
		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify three mechanics trades occupations.		
	07.02	Relate the types of duties required of workers in each of three mechanics trades areas.		
	07.03	Describe the working conditions of workers in each of three mechanics trades areas.		
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to the mechanics trades.		
	10.03 Follow safety rules established for power equipment.		
	10.04 Safely use common mechanics trades power tools and equipment.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Interpret mechanics trade drawings.		
	11.02 Interpret mechanics trade manuals.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Identify common mechanics trades measuring tools.		
	12.02 Use measuring tools to measure a specific mechanics trade job.		
	12.03 Use mechanics trades precision measuring tools.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Complete an assigned task in the auto mechanics area.		
	13.02 Complete an assigned task in the small gas engine area.		
	13.03 Complete an assigned task in another mechanics area.		
14.0	Identify pertinent materials and processes--The student will be able to:		
	14.01 Identify by name various mechanical parts.		
	14.02 Identify by use of parts catalogs the use of given mechanical parts.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.04	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Florida Right-To-Know Law" as recorded in Florida Statutes, Chapter 442.		
18.10	Adapt to change.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the mechanics trades.		
20.02	List 3 different local mechanics trades job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more mechanics trades areas.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Construction Trades**
Course Number: **8700330**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards			Correlation to CTE Program Standard #
	05.04	Range of Writing	
		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify four construction trades occupations.		
	07.02	Relate the types of duties required of employees in each of two construction trades areas.		
	07.03	Describe the working conditions of workers in each of three construction trades areas.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be able to:		
08.01	Demonstrate acceptable employee health habits.		
08.02	Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
09.01	Identify physical safety rules.		
09.02	Identify physical safety hazards.		
09.03	Recognize and correct or report physical safety hazards.		
09.04	Identify electrical safety rules.		
09.05	Identify electrical safety hazards.		
09.06	Recognize and correct or report electrical safety hazards.		
09.07	Identify fire safety rules.		
09.08	Identify fire safety hazards.		
09.09	Recognize and correct or report fire safety hazards.		
09.10	Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
10.01	Follow safety rules and procedures.		
10.02	Identify and properly use hand tools common to the construction trades.		
10.03	Follow safety rules established for power equipment.		
10.04	Safely use common construction trades power tools.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
11.01	Interpret blueprints of various construction trades.		
11.02	Draw freehand sketches of specific construction trade jobs.		
11.03	Make a floor plan for a residence showing plumbing and electrical symbols.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
12.01	Identify common construction trades measurement and layout tools.		
12.02	Use measuring tools to layout a given construction trade job to specific dimensions.		
12.03	Use precision construction trades measurement tools.		
13.0	Construct projects or complete tasks--The student will be able to:		
13.01	Prepare a sketched plan and construct a carpentry project.		
13.02	Prepare a sketched plan and construct a brick or block laying project.		
13.03	Complete an assigned task in another construction trade area.		
14.0	Identify pertinent materials and processes--The student will be able to:		
14.01	Identify by name various types of building materials.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.02	Identify by name various shapes of concrete block.		
14.03	Identify various roofing materials.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.04	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	1910.1200).		
18.10	Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the construction trades.		
20.02	List 3 different local construction trades job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more construction trades.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Electrical/Electronics**
Course Number: **8700340**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards			Correlation to CTE Program Standard #
	05.04	Range of Writing	
		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify four electrical/electronics occupations.		
	07.02	Relate the types of duties required of workers in each of three electrical/electronics trades areas.		
	07.03	Describe the working conditions of workers in each of three electrical/electronics trades		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	area.		
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to the electrical/electronics trades.		
	10.03 Follow safety rules established for power equipment.		
	10.04 Safely use common electrical/electronics trades.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Interpret schematic symbols and diagrams.		
	11.02 Interpret block diagrams.		
	11.03 Interpret flow charts.		
	11.04 Draw a simple schematic diagram.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Identify common electrical/electronics trades measurement tools.		
	12.02 Use precision electrical/electronics meters to measure specific quantities.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Prepare a schematic and wire an electronics project.		
	13.02 Prepare a circuit diagram and wire a residential circuit.		
	13.03 Prepare a block diagram and wire a logic circuit on a trainer.		
14.0	Identify pertinent materials and processes--The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.01	Identify by name various types electronics components.		
14.02	Identify by name given electrical hardware.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		
16.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.05	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.08 Use and conserve resources and energy.		
	18.09 Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		
	18.10 Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
	19.01 Define entrepreneurship.		
	19.02 Describe the importance of entrepreneurship to the American economy.		
	19.03 Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
	20.01 List 3 ways to find a job in the electrical/electronics trades.		
	20.02 List 3 different local electrical/electronics trades job openings, the qualifications for each and the salary for each.		
	20.03 List the local training opportunities available in 3 electrical/electronics trades area.		
21.0	Demonstrate team skills--The student will be able to:		
	21.01 Participate as a responsible "team member" during laboratory activities.		
	21.02 Work cooperatively with others.		
	21.03 Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Metal Work**
Course Number: **8700350**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

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03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
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	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
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04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
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	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
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Florida Standards			Correlation to CTE Program Standard #
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		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify four metals trades occupations.		
	07.02	Relate the types of duties required of employees in each of two metals trades areas.		
	07.03	Describe the working conditions of employees in each of two metals trades areas.		
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to the sheetmetals, machine shop and welding trades.		
	10.03 Follow safety rules established for power equipment.		
	10.04 Safely use common machine shop, welding and sheetmetal trades power tools and equipment.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Interpret various metals trades plans.		
	11.02 Draw freehand sketches of specific metals trades projects with dimensions.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Identify common metals trades measurement and layout tools.		
	12.02 Use measuring tools to layout a given metals trade job to specific dimensions.		
	12.03 Use precision metals trades measurement tools.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Prepare a sketched working drawing, select materials and construct a useful sheetmetal project.		
	13.02 Prepare a sketched working drawing, select materials and construct a useful machine shop project.		
	13.03 Prepare a sketched working drawing, select materials and construct a useful welding project.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Identify pertinent materials and processes--The student will be able to:		
14.01	Identify by name given sheetmetal samples.		
14.02	Identify by name given sheet structural shapes.		
14.03	Identify the uses of common metals used in machine shop work.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Measure tolerance(s) on horizontal and vertical surfaces using millimeters, centimeters, feet and inches.		
16.03	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.04	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.05	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
17.04	Understand pressure measurement in terms of P.S.I., inches of mercury, and K.P.A.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		
18.10	Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the metals trades.		
20.02	List 3 different local metals trades job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more metals trades areas.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Commercial Foods**
Course Number: **8700360**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards	Correlation to CTE Program Standard #
05.04 Range of Writing	
05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
06.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
06.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
06.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
06.04 Model with mathematics. MAFS.K12.MP.4.1	
06.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
06.06 Attend to precision. MAFS.K12.MP.6.1	
06.07 Look for and make use of structure. MAFS.K12.MP.7.1	
06.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.0 Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:		
07.01 Identify four food service occupations.		
07.02 Relate the duties and responsibilities of workers in each of four identified occupations.		
07.03 Describe the working conditions of persons employed in each of four identified occupations.		
08.0 Demonstrate acceptable professional and personal sanitation practices--The student will be		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
able to:		
08.01 Chemical/Cleaning Agents		
a. Identify chemicals/cleaning agents and describe and practice proper usage.		
b. Identify and practice proper storage procedures for chemicals/cleaning agents.		
c. Identify and practice personnel handling precautions for caustics and acids.		
d. Identify dangers of food contamination by chemicals/cleaning agents and identify and practice precautions against food contamination by chemicals/cleaning agents.		
08.02 Food Borne Illness		
a. Identify food borne illness and possible/probable causes.		
b. Identify and practice preventative measures to preclude the occurrence of food borne illness.		
08.03 Personal Sanitation		
a. Recognize and practice personal hygiene standards consistent with aesthetic and sanitation requirements of food service operations.		
08.04 Receiving/Dry Stores Area		
a. Recognize and maintain a clean and sanitary receiving/dry stores area.		
b. Clean and sanitize floors and walls.		
c. Recognize and report indications of food spoilage.		
d. Recognize and report indications of insect or rodent infestation.		
08.05 Food Preparation Areas		
a. Recognize and maintain clean and sanitary food preparation surfaces.		
b. Clean and sanitize floors and walls.		
c. Recognize and report indications of insect or rodent infestation.		
09.0 Demonstrate safe working practices--The student will be able to:		
09.01 Safety Hazards		
a. Identify physical safety rules.		
b. Identify physical safety hazards.		
c. Recognize and correct or report physical safety hazards.		
d. Identify electrical safety rules.		
e. Identify electrical safety hazards.		
f. Recognize and correct or report electrical safety hazards.		
g. Identify fire safety rules.		
h. Identify fire safety hazards.		
i. Recognize and correct or report fire safety hazards.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
09.02	First Aid		
	a. Identify first aid requirements for a commercial food service operation.		
	b. Prepare subject and perform Heimlich maneuver.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
10.01	Hand Tools		
	a. Identify special precautions to be used when working with hand tools.		
	b. Select and use hand tools in a safe and efficient manner.		
10.02	Knives and Cutting Tools		
	a. Identify special precautions to be used when working with knives and cutting tools.		
	b. Sharpen correctly knives and cutting tools. Inspect handles and guards and report any discrepancy.		
	c. Use knives and cutting tools in a safe and efficient manner.		
10.03	Mixers and Blenders		
	a. Identify special precautions to be used when working with mixers and blenders.		
	b. Correctly assemble and disassemble equipment.		
	c. Operate mixers and blenders in a safe and efficient manner.		
	d. Perform the above competencies for all accessories or attachments used with the equipment.		
10.04	Ovens, Ranges, Griddles, Fryers, Broilers, and Toasters		
	a. Identify special precautions to be used when working with ovens, ranges, griddles, fryers, broilers and toasters.		
	b. Correctly assemble and disassemble equipment. Inspect all parts and report any discrepancy.		
	c. Operate ovens, ranges, griddles, fryers, broilers and toasters in a safe and efficient manner.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
11.01	Select appropriate recipe or recipes for a given food product.		
11.02	Identify ingredients and required quantities for a given recipe.		
11.03	Convert recipes for both greater and lesser number of portions.		
11.04	Draw a simple schematic diagram.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
12.01	Identify standard volume, liquid and weight, as they apply to commercial food operations.		
12.02	Convert accurately between standard units of measure as applicable to commercial food operations.		
13.0	Construct projects or complete tasks--The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.01 Identify and select materials for a given recipe.		
	13.02 Prepare given recipe.		
	13.03 Hold product for service.		
	13.04 Garnish and present product as appropriate.		
	13.05 Store reusable portions.		
14.0	Identify pertinent materials and processes--The student will be able to:		
	14.01 Identify chemical/cleaning agents and their respective use and precautions.		
	14.02 Identify consumable non-food items and their respective used.		
	14.03 Identify food groups and associated hazards and precautions.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
	15.01 Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
	15.02 Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
	15.03 Read and follow written and oral instructions.		
	15.04 Answer and ask questions coherently and concisely.		
	15.05 Read critically by recognizing assumptions and implications and by evaluating ideas.		
	15.06 Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
	16.01 Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
	16.02 Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
	16.03 Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
	16.04 Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
	17.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
	17.02 Draw conclusions or make inferences from data.		
	17.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
	18.01 Locate and select employment opportunities.		
	18.02 Understand employment capabilities.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		
18.10	Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the food service industry.		
20.02	List 3 different local food service industry job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more food service industries.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Graphic Arts**
Course Number: **8700370**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards	Correlation to CTE Program Standard #
05.04 Range of Writing	
05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
06.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
06.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
06.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
06.04 Model with mathematics. MAFS.K12.MP.4.1	
06.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
06.06 Attend to precision. MAFS.K12.MP.6.1	
06.07 Look for and make use of structure. MAFS.K12.MP.7.1	
06.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.0 Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:		
07.01 Identify four graphic occupations.		
07.02 Relate the types of duties required of workers in each of four graphic occupations.		
07.03 Describe the working conditions of workers in each of four graphic occupations.		
08.0 Demonstrate acceptable professional and personal sanitation practices--The student will be		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to graphics trades.		
	10.03 Follow safety rules established for power equipment.		
	10.04 Safely use power equipment common to the graphics trades.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Prepare thumbnail layout.		
	11.02 Prepare rough layout.		
	11.03 Prepare comprehensive layout including finished working dummy.		
	11.04 Paste up mechanical elements.		
	11.05 Operate desktop publishing equipment.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Use printer's measurements to compute inches and fractions, points and picas, and decimals, percentages and proportions.		
	12.02 Identify characteristics of printing papers to specify basic weights, sizes and grades.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Complete an assigned task in pre-press operations.		
	13.02 Complete an assigned task in offset press operations.		
	13.03 Complete an assigned task in finishing bindery operations.		
14.0	Identify pertinent materials and processes--The student will be able to:		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.01	Identify by name given graphic trade's materials.		
14.02	Identify the uses of given graphic trades materials.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.04	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	1910.1200).		
18.10	Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
19.01	Define entrepreneurship.		
19.02	Describe the importance of entrepreneurship to the American economy.		
19.03	Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
20.01	List 3 ways to find a job in the graphic trades.		
20.02	List 3 different local graphic trades job openings, the qualifications for each and the salary for each.		
20.03	List the local training opportunities available in 3 or more graphic trades.		
21.0	Demonstrate team skills--The student will be able to:		
21.01	Participate as a responsible "team member" during laboratory activities.		
21.02	Work cooperatively with others.		
21.03	Perform a role in the shop cleanup and housekeeping schedule.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Drafting**
Course Number: **8700380**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards			Correlation to CTE Program Standard #
	05.04	Range of Writing	
		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
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Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify occupations utilizing drafting and/or drafting skills as a part of the job description.		
	07.02	Relate the types of drafting duties required of employees in each of two of the identified occupations.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be able to:		
08.01	Demonstrate acceptable employee health habits.		
08.02	Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
09.01	Follow drafting room rules and procedures.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
10.01	Differentiate the Alphabet of Lines.		
10.02	Use various freehand and other lettering techniques.		
10.03	Produce freehand sketches.		
10.04	Use and maintain the drafting station including T-square, parallel rule and drafting or track machine.		
10.05	Select proper pencils and pens.		
10.06	Use and maintain triangles, protractors, French curves, templates and drafting instruments.		
10.07	Make reproductive copies.		
10.08	Plot a drawing generated by CAD.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
11.01	Identify three types of plans and schematics and explain the use of each.		
11.02	Read and interpret three plans and/or schematics.		
11.03	Define working drawings.		
11.04	Prepare working drawings utilizing auxiliaries and/or sections.		
11.05	Make corrections to drawings.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
12.01	Use engineers, architects and metric scales.		
13.0	Construct projects or complete tasks--The student will be able to:		
13.01	Prepare orthographic drawings.		
13.02	Prepare section drawings.		
13.03	Prepare auxiliary drawings.		
13.04	Prepare drawings with dimensions.		
13.05	Organize and complete assigned drafting problems.		
13.06	Explain methods of pictorial drawing.		
13.07	Prepare isometric drawings.		
13.08	Prepare oblique drawings.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	13.09 Prepare perspective drawings.		
	13.10 Explain methods of surface developments.		
	13.11 Prepare drawings with stretchouts of prisms, cones, cylinders and pyramids.		
	13.12 Prepare drawings involving intersecting pieces.		
	13.13 Apply basic knowledge and skills of drafting on CAD systems by completing assigned drawings in either engineering, architectural or technical illustration classification.		
14.0	Identify pertinent materials and processes--The student will be able to:		
	14.01 Identify by name tools and materials used in drafting.		
	14.02 Identify the uses of given tools and materials.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
	15.01 Interpret reports and specifications.		
	15.02 Research and prepare technical reports.		
	15.03 Prepare visual aids and handouts and give technical report.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
	16.01 Solve arithmetic problems.		
	16.02 Solve algebra problems.		
	16.03 Solve geometry problems.		
	16.04 Solve trigonometry problems.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
	17.01 Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
	17.02 Draw conclusions or make inferences from data.		
	17.03 Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
	18.01 Locate and select employment opportunities.		
	18.02 Understand employment capabilities.		
	18.03 Demonstrate employment seeking skills.		
	18.04 Demonstrate appropriate work behavior.		
	18.05 Project a professional image.		
	18.06 Work individually and cooperatively as a member of regular or culturally diverse team.		
	18.07 Balance personal and professional life.		
	18.08 Use and conserve resources and energy.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.09 Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		
	18.10 Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
	19.01 Define entrepreneurship.		
	19.02 Describe the importance of entrepreneurship to the American economy.		
	19.03 Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
	20.01 List 3 ways to find a job in the drafting field.		
	20.02 List 3 different local drafting job openings, the qualifications for each and the salary for each.		
	20.03 List the local training opportunities available in 3 or more drafting occupations.		
21.0	Demonstrate team skills--The student will be able to:		
	21.01 Participate as a responsible "team member" during laboratory activities.		
	21.02 Work cooperatively with others.		

Florida Department of Education
Student Performance Standards

Course Title: **Practical Aviation Careers**
Course Number: **8700390**
Course Credit: **1**

Course Description:

If the majority of students enrolled in this course consist of **9th and 10th** graders, use Standards 01.0, 02.0, and 03.0 in addition to Standards 07.0 thru 21.0

If the majority of students enrolled in this course consist of **11th and 12th** graders, use Standards 04.0, 05.0, and 06.0 in addition to Standards 07.0 thru 21.0

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	

Florida Standards			Correlation to CTE Program Standard #
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	

Florida Standards		Correlation to CTE Program Standard #
02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
02.02	Production and Distribution of Writing	
02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge	
02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing	
02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	

Florida Standards			Correlation to CTE Program Standard #
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
	03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
	03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
	03.04 Model with mathematics. MAFS.K12.MP.4.1		
	03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1		
	03.06 Attend to precision. MAFS.K12.MP.6.1		
	03.07 Look for and make use of structure. MAFS.K12.MP.7.1		
	03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Florida Standards			Correlation to CTE Program Standard #
04.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	04.01 Key Ideas and Details		
	04.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	04.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	04.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	04.02 Craft and Structure		
	04.02.1	Determine the meaning of symbols key terms, and other domain-specific	

Florida Standards			Correlation to CTE Program Standard #
		words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	04.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	04.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
	04.03	Integration of Knowledge and Ideas	
	04.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	04.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	04.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	04.04	Range of Reading and Level of Text Complexity	
	04.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	04.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
05.0		Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Practical, Technical and Industrial Occupations.	
	05.01	Text Types and Purposes	
	05.01.1	Write arguments focused on discipline-specific content.	

Florida Standards			Correlation to CTE Program Standard #
		LAFS.1112.WHST.1.1	
	05.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	05.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
05.02	Production and Distribution of Writing		
	05.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	05.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	05.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
05.03	Research to Build and Present Knowledge		
	05.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	05.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	05.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	

Florida Standards			Correlation to CTE Program Standard #
	05.04	Range of Writing	
		05.04.1 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
06.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Practical, Technical and Industrial Occupations.		
	06.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
	06.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
	06.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
	06.04	Model with mathematics. MAFS.K12.MP.4.1	
	06.05	Use appropriate tools strategically. MAFS.K12.MP.5.1	
	06.06	Attend to precision. MAFS.K12.MP.6.1	
	06.07	Look for and make use of structure. MAFS.K12.MP.7.1	
	06.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci.

CTE Standards and Benchmarks			FS-M/LA	NGSSS-Sci
07.0	Demonstrate realistic knowledge of occupations, skills, and work environment--The student will be able to:			
	07.01	Identify four aviation trades occupations.		
	07.02	Relate the types of duties required of workers in each of four aviation trades areas.		
	07.03	Describe the working conditions of workers in each of four aviation trades areas.		
08.0	Demonstrate acceptable professional and personal sanitation practices--The student will be			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	able to:		
	08.01 Demonstrate acceptable employee health habits.		
	08.02 Identify or demonstrate acceptable personal grooming habits.		
09.0	Demonstrate safe working practices--The student will be able to:		
	09.01 Identify physical safety rules.		
	09.02 Identify physical safety hazards.		
	09.03 Recognize and correct or report physical safety hazards.		
	09.04 Identify electrical safety rules.		
	09.05 Identify electrical safety hazards.		
	09.06 Recognize and correct or report electrical safety hazards.		
	09.07 Identify fire safety rules.		
	09.08 Identify fire safety hazards.		
	09.09 Recognize and correct or report fire safety hazards.		
	09.10 Identify first aid requirements.		
10.0	Demonstrate equipment operation skills--The student will be able to:		
	10.01 Follow safety rules and procedures.		
	10.02 Identify and properly use hand tools common to the aviation trades.		
	10.03 Follow safety rules established for power equipment.		
	10.04 Safely use common aviation trades power tools and equipment.		
11.0	Produce and interpret pertinent technical documentation--The student will be able to:		
	11.01 Interpret drawings, symbols and schematic diagrams.		
	11.02 Interpret aviation manuals.		
12.0	Use units and measurements relating to subject occupations--The student will be able to:		
	12.01 Identify common aviation measurements.		
	12.02 Use measuring tools to perform specified powerplant tasks.		
	12.03 Use measuring tools to perform specified airframe tasks.		
	12.04 Use measuring tools to perform electrical tasks.		
13.0	Construct projects or complete tasks--The student will be able to:		
	13.01 Complete an assigned powerplant task.		
	13.02 Complete an assigned airframe task.		
	13.03 Complete an assigned electrical task.		
14.0	Identify pertinent materials and processes--The student will be able to:		
	08.01 Identify powerplant components and system relationship.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.02	Identify airframe components and system relationship.		
08.03	Identify electrical components and system relationship.		
15.0	Demonstrate appropriate communication skills--The student will be able to:		
15.01	Write logical and understandable statements, or phrases, to accurately fill out forms/invoices commonly used in business and industry.		
15.02	Read and understand graphs, charts, diagrams, and tables commonly used in this industry/occupation area.		
15.03	Read and follow written and oral instructions.		
15.04	Answer and ask questions coherently and concisely.		
15.05	Read critically by recognizing assumptions and implications and by evaluating ideas.		
15.06	Demonstrate appropriate telephone/communication skills.		
16.0	Demonstrate appropriate math skills--The student will be able to:		
16.01	Solve problems for volume, weight, area, circumference and perimeter measurements for rectangles, squares, and cylinders.		
16.02	Add, subtract, multiply and divide using fractions, decimals, and whole numbers.		
16.03	Determine the correct purchase price, to include sales tax for a materials list containing a minimum of six items.		
16.04	Demonstrate an understanding of federal, state and local taxes and their computation.		
17.0	Demonstrate appropriate understanding of basic science--The student will be able to:		
17.01	Understand molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
17.02	Draw conclusions or make inferences from data.		
17.03	Identify health-related problems, which may result from exposure to work related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
18.0	Demonstrate employability skills--The student will be able to:		
18.01	Locate and select employment opportunities.		
18.02	Understand employment capabilities.		
18.03	Demonstrate employment seeking skills.		
18.04	Demonstrate appropriate work behavior.		
18.05	Project a professional image.		
18.06	Work individually and cooperatively as a member of regular or culturally diverse team.		
18.07	Balance personal and professional life.		
18.08	Use and conserve resources and energy.		
18.09	Demonstrate knowledge of the "Right-To-Know Law" as recorded in (29 CFR-1910.1200).		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
	18.10 Adapt to change.		
19.0	Demonstrate an understanding of entrepreneurship--The student will be able to:		
	19.01 Define Entrepreneurship.		
	19.02 Describe the importance of Entrepreneurship to the American economy.		
	19.03 Identify the necessary personal characteristics of a successful entrepreneur.		
20.0	Use employability skills to research job and training opportunities--The student will be able to:		
	20.01 List 3 ways to find a job in the aviation trades.		
	20.02 List 3 different local aviation trades job openings, the qualifications for each and the salary for each.		
	20.03 List the local training opportunities available in 3 or more aviation trades.		
21.0	Demonstrate team skills--The student will be able to:		
	21.01 Participate as a responsible "team member" during laboratory activities.		
	21.02 Work cooperatively with others.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Major Appliance and Refrigeration Repair**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8706000
CIP Number	0647010601
Grade Level	9-12, 30, 31
Standard Length	10 credits
Teacher Certification	APPLI REPR @7 7G GAS FITTER 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9031 – Home Appliance Repairers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the Manufacturing 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 Manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in appliance and refrigeration repair support services positions.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, electrical and refrigeration skills, analyzing, diagnosing and repairing washers, dryers, dishwashers, trash compactors, ranges, refrigerators, freezers, microwave ovens, and window air conditioners.

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 four occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8706010	Residential Appliance and Refrig. Repair 1	1 credit		2
A	8706020	Residential Appliance and Refrig. Repair 2	1 credit	49-9031	2
	8706030	Residential Appliance and Refrig. Repair 3	1 credit		2
B	8706040	Residential Appliance and Refrig. Repair 4	1 credit	49-9031	2
	8706050	Residential Appliance and Refrig. Repair 5	1 credit		2
	8706060	Residential Appliance and Refrig. Repair 6	1 credit		2
C	8706070	Major Appliance and Refrig. Repair 7	1 credit	49-9031	2
	8706080	Major Appliance and Refrig. Repair 8	1 credit		2
	8706090	Major Appliance and Refrig. Repair 9	1 credit		2
D	8706100	Major Appliance and Refrig. Repair 10	1 credit	49-9031	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Residential Appliance and Refrig. Repair 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Residential Appliance and Refrig. Repair 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Residential Appliance and Refrig. Repair 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Residential Appliance and Refrig. Repair 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Residential Appliance and Refrig. Repair 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Residential Appliance and Refrig. Repair 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Major Appliance and Refrig. Repair 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Major Appliance and Refrig. Repair 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Major Appliance and Refrig. Repair 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Major Appliance and Refrig. Repair 10	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
04.0 Apply proper laboratory practices.
05.0 Apply electrical fundamentals.
06.0 Apply gas fundamentals.
07.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
08.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
09.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.
10.0 Install, troubleshoot and repair electric clothes dryers.
11.0 Install, troubleshoot and repair gas clothes dryers.
12.0 Install, troubleshoot and repair clothes washers.
13.0 Install, troubleshoot and repair electric ranges.
14.0 Install, troubleshoot and repair microwave ovens.
15.0 Install, troubleshoot and repair gas ranges.
16.0 Install, troubleshoot and repair dishwashers.
17.0 Utilize fundamentals of refrigeration.
18.0 Work with tubing and fittings.
19.0 Install, troubleshoot and repair refrigerators, icemakers and freezers.
20.0 Install, troubleshoot and repair window air conditioners.

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 1**
Course Number: **8706010**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in laboratory practices and electrical fundamentals.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Apply proper laboratory practices--The student will be able to:		
04.01 Use industry accepted safety practices.		
04.02 Explain appropriate first aid for electrical shock and potential shop accidents.		
04.03 Perform appropriate record keeping functions.		
04.04 Explain and demonstrate the proper use and care of hand tools.		
04.05 Explain and demonstrate the proper use and care of meters and test equipment.		
04.06 Explain and demonstrate the proper use and care of power tools.		
05.0 Apply electrical fundamentals--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.01 Explain electron theory.		
05.02 Identify circuits from schematics and diagrams using commonly accepted symbols.		
05.03 Explain Ohm's Law.		
05.04 Measure resistance.		
05.05 Measure voltage.		
05.06 Measure amperage.		
05.07 Measure wattage.		
05.08 Explain and construct series circuits.		
05.09 Explain and construct parallel circuits.		
05.10 Explain and construct combination circuits.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 2**
Course Number: **8706020**
Course Credit: **1**

Course Description:

This course is designed to provide advanced instruction in electrical practices as well as gas fundamentals.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.0 Apply electrical fundamentals--The student will be able to:		
05.11 Explain inductance and magnetism and their relationship to electric motors.		
05.12 Describe how electric motors function.		
05.13 Explain the function of capacitors and how to troubleshoot them.		
05.14 Explain the function of relay and switches and how to troubleshoot them.		
05.15 Explain the function of capacitors and transformers in major appliances.		
05.16 Explain the concept and rationale of motor protection.		
05.17 Describe how a compressor functions.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.0 Apply gas fundamentals--The student will be able to:		
06.01 Explain common use terms.		
06.02 Explain different types of gas.		
06.03 Explain specific gravity.		
06.04 Diagram and explain basic components of a gas burner.		
06.05 Explain requirements for burning.		
06.06 Perform pressure tests on gas systems.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 3**
Course Number: **8706030**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing clothes dryers.

Florida Standards			Correlation to CTE Program Standard #
07.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
	07.01 Key Ideas and Details		
	07.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	07.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	07.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	07.02 Craft and Structure		
	07.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	07.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	07.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
07.03	Integration of Knowledge and Ideas		
	07.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	07.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	07.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
07.04	Range of Reading and Level of Text Complexity		
	07.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	07.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
08.01	Text Types and Purposes		
	08.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	08.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	08.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
08.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	08.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	08.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	08.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
08.03	Research to Build and Present Knowledge		
	08.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	08.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	08.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
08.04	Range of Writing		
	08.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
09.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
09.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
09.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
09.04 Model with mathematics. MAFS.K12.MP.4.1	
09.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
09.06 Attend to precision. MAFS.K12.MP.6.1	
09.07 Look for and make use of structure. MAFS.K12.MP.7.1	
09.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Install, troubleshoot, and repair electric clothes dryer--The student will be able to:		
10.01 Install an electric dryer.		
10.02 Identify components and their function.		
10.03 Troubleshoot timers and components.		
10.04 Remove and replace manual timer, electronic controls or components.		
10.05 Troubleshoot drive motors and components.		
10.06 Remove and replace drive motor or component.		
10.07 Troubleshoot heating elements and components.		
10.08 Remove and replace element or component.		
10.09 Remove and replace thermostats.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.10 Troubleshoot thermostats.		
10.11 Troubleshoot bearings and components.		
10.12 Remove and replace bearing or component.		
10.13 Troubleshoot belts and pulleys.		
10.14 Remove and replace belt or pulley.		
10.15 Troubleshoot rollers and glides.		
10.16 Remove and replace roller or glides.		
10.17 Troubleshoot filters.		
10.18 Remove and replace filter.		
10.19 Troubleshoot seals.		
10.20 Remove and replace seals.		
10.21 Troubleshoot push-to-start switch.		
10.22 Remove and replace push-to-start switch.		
10.23 Troubleshoot door switches.		
10.24 Remove and replace door switches.		
10.25 Troubleshoot selector switches.		
10.26 Remove and replace selector switches.		
10.27 Remove and replace sensor and electronic control.		
10.28 Troubleshoot sensor and electronic control.		
10.29 Perform operational check.		
10.30 Instruct consumer on use and care.		
11.0 Install, troubleshoot and repair gas clothes dryers--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.01 Install a gas dryer.		
11.02 Identify components and their function.		
11.03 Read and interpret schematics and diagrams.		
11.04 Troubleshoot electric ignition components.		
11.05 Remove and replace electric ignition components.		
11.06 Troubleshoot timers and electronic controls and components.		
11.07 Remove and replace timer electronic control or component.		
11.08 Troubleshoot drive motors.		
11.09 Remove and replace drive motor.		
11.10 Troubleshoot gas burner.		
11.11 Remove and replace gas burner.		
11.12 Troubleshoot thermostats.		
11.13 Remove and replace thermostat.		
11.14 Troubleshoot gas valves.		
11.15 Remove and replace gas valve.		
11.16 Troubleshoot thermocouples.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 4**
Course Number: **8706040**
Course Credit: **1**

Course Description:

This course is designed to provide advanced instruction in installing, troubleshooting and repairing clothes dryers as well as washers.

Florida Standards			Correlation to CTE Program Standard #
07.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
	07.01 Key Ideas and Details		
	07.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	07.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	07.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	07.02 Craft and Structure		
	07.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	07.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	07.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
07.03	Integration of Knowledge and Ideas		
	07.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	07.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	07.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
07.04	Range of Reading and Level of Text Complexity		
	07.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	07.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
08.01	Text Types and Purposes		
	08.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	08.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	08.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
08.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	08.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	08.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	08.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
08.03	Research to Build and Present Knowledge		
	08.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	08.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	08.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
08.04	Range of Writing		
	08.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Major Appliance and Refrigeration Repair.		
09.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
09.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
09.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
09.04 Model with mathematics. MAFS.K12.MP.4.1	
09.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
09.06 Attend to precision. MAFS.K12.MP.6.1	
09.07 Look for and make use of structure. MAFS.K12.MP.7.1	
09.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Install, troubleshoot and repair gas clothes dryers--The student will be able to:		
11.17 Remove and replace thermocouple.		
11.18 Troubleshoot flame switch.		
11.19 Remove and replace flame switch.		
11.20 Troubleshoot bearing assemblies and components.		
11.21 Remove and replace bearing or component.		
11.22 Troubleshoot belts and pulleys.		
11.23 Remove and replace belt or pulley.		
11.24 Troubleshoot rollers and glides.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.25 Remove and replace roller or glide.		
11.26 Troubleshoot seals.		
11.27 Remove and replace seals.		
11.28 Troubleshoot door switches.		
11.29 Remove and replace door switch.		
11.30 Troubleshoot selector switches.		
11.31 Remove and replace selector switch.		
11.32 Troubleshoot motor switches.		
11.33 Remove and replace motor switch.		
11.34 Perform operational check.		
11.35 Instruct consumer on use and care.		
12.0 Install, troubleshoot and repair clothes washers--The student will be able to:		
12.01 Install a clothes washer.		
12.02 Identify components and their function.		
12.03 Read and interpret schematics and diagrams.		
12.04 Troubleshoot manual timers, electronic controls and components.		
12.05 Remove and replace timer or component.		
12.06 Troubleshoot selector switches.		
12.07 Remove and replace selector switch.		
12.08 Troubleshoot water level switches and components.		
12.09 Remove and replace water level switch or component.		
12.10 Troubleshoot water inlet valves and components.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.11 Remove and replace water inlet valve or component.		
12.12 Troubleshoot hoses.		
12.13 Remove and replace hoses.		
12.14 Troubleshoot water pumps and components.		
12.15 Remove and replace water pump or component.		
12.16 Troubleshoot filters to include front load washers.		
12.17 Remove and replace filters to include front load washers.		
12.18 Troubleshoot drive motors and components.		
12.19 Remove and replace drive motor or component.		
12.20 Troubleshoot belts and pulleys.		
12.21 Remove and replace belt or pulley.		
12.22 Troubleshoot transmissions and components.		
12.23 Remove and replace transmission or component.		
12.24 Troubleshoot bearings.		
12.25 Remove and replace bearings.		
12.26 Troubleshoot water and oil seals.		
12.27 Remove and replace water and oil seals.		
12.28 Troubleshoot clutches.		
12.29 Remove and replace clutch.		
12.30 Troubleshoot brakes.		
12.31 Remove and replace brake.		
12.32 Troubleshoot lid switches and components.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.33 Remove and replace lid switch or component.		
12.34 Perform operational check.		
12.35 Instruct consumer on use and care.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 5**
Course Number: **8706050**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing electric ranges.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Install, troubleshoot, and repair electric ranges--The student will be able to:		
13.01 Install an electric range.		
13.02 Describe the operation and application of components.		
13.03 Read and interpret schematics and diagrams.		
13.04 Troubleshoot clocks/timers.		
13.05 Remove and replace clocks/timers.		
13.06 Troubleshoot surface unit switches and components.		
13.07 Remove and replace surface switches or components.		
13.08 Troubleshoot oven thermostats and components.		
13.09 Remove and replace oven thermostats or components.		
13.10 Troubleshoot oven selector switches and components.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.11 Remove and replace oven selector switches or components including induction cook-tops and ranges.		
13.12 Troubleshoot surface units and components including induction cook-tops and ranges.		
13.13 Remove and replace surface units or components including induction cook-tops and ranges.		
13.14 Troubleshoot bake and broil elements.		
13.15 Remove and replace bake and broil elements.		
13.16 Troubleshoot electronic controls.		
13.17 Remove and replace electronic controls.		
13.18 Troubleshoot time delay relays.		
13.19 Remove and replace time delay relay.		
13.20 Troubleshoot oven sensors and components.		
13.21 Remove and replace oven sensor or component.		
13.22 Troubleshoot door locks and components.		
13.23 Remove and replace door lock or component.		
13.24 Troubleshoot fans.		
13.25 Remove and replace fan.		
13.26 Troubleshoot gaskets and seals.		
13.27 Remove and replace gasket or seals.		
13.28 Perform operational check.		
13.29 Instruct consumer on use and care.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 6**
Course Number: **8706060**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing gas ranges as well as microwave ovens.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.0 Install, troubleshoot, and repair microwave ovens--The student will be able to:		
14.01 Install a microwave oven.		
14.02 Describe the operation and application of components.		
14.03 Read and interpret schematics and diagrams.		
14.04 Troubleshoot clocks/timers/electronic controls.		
14.05 Remove and replace clocks/timers/electronic controls.		
14.06 Troubleshoot door switches.		
14.07 Remove and replace door switches.		
14.08 Troubleshoot relays.		
14.09 Remove and replace relays.		
14.10 Troubleshoot thermal protectors.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.11 Remove and replace thermal protectors.		
14.12 Troubleshoot the power transformer.		
14.13 Remove and replace the power transformer.		
14.14 Troubleshoot the high voltage diode.		
14.15 Remove and replace the high voltage diode.		
14.16 Troubleshoot the capacitor.		
14.17 Remove and replace the capacitor.		
14.18 Troubleshoot the magnetron.		
14.19 Remove and replace the magnetron.		
14.20 Troubleshoot the fan.		
14.21 Remove and replace the fan.		
14.22 Troubleshoot the stirrer blade and motor.		
14.23 Remove and replace the stirrer blade and motor.		
14.24 Troubleshoot the turntable motor.		
14.25 Remove and replace the turntable motor.		
14.26 Perform operational check.		
14.27 Instruct consumer on use and care.		
15.0 Install, troubleshoot, and repair gas ranges--The student will be able to:		
15.01 Install a gas range.		
15.02 Identify components and their function.		
15.03 Read and interpret schematics and diagrams.		
15.04 Troubleshoot clocks/timers/electronic controls.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.05 Remove and replace clocks/timers/electronic controls.		
15.06 Troubleshoot oven thermostats.		
15.07 Remove and replace oven thermostats.		
15.08 Troubleshoot oven selector switches.		
15.09 Remove and replace oven selector switches.		
15.10 Troubleshoot self-clean relays.		
15.11 Remove and replace self-clean relays.		
15.12 Troubleshoot oven sensors.		
15.13 Remove and replace oven sensor.		
15.14 Troubleshoot door locks.		
15.15 Remove and replace door lock.		
15.16 Troubleshoot fans.		
15.17 Remove and replace fan.		
15.18 Troubleshoot gas valves for surface burners.		
15.19 Remove and replace gas valve for surface burner.		
15.20 Troubleshoot gas valve for oven.		
15.21 Remove and replace gas valve for oven.		
15.22 Troubleshoot electric igniters.		
15.23 Remove and replace electric igniter.		
15.24 Troubleshoot safety valves.		
15.25 Remove and replace safety valve.		
15.26 Troubleshoot pressure regulators.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.27 Remove and replace pressure regulator.		
15.28 Troubleshoot door seals/gaskets.		
15.29 Remove and replace door seal/gasket.		
15.30 Perform operational check.		
15.31 Instruct consumer on use and care.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 7**
Course Number: **8706070**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing dishwashers.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Install, troubleshoot, and repair dishwashers--The student will be able to:		
16.01 Install a dishwasher.		
16.02 Identify components and their function.		
16.03 Read and interpret schematics and diagrams.		
16.04 Troubleshoot timers and electronic control or components.		
16.05 Remove and replace timer and electronic control or component.		
16.06 Troubleshoot selector switches.		
16.07 Remove and replace selector switch.		
16.08 Troubleshoot float switches.		
16.09 Remove and replace float switch.		
16.10 Troubleshoot door switches.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.11 Remove and replace door switch.		
16.12 Troubleshoot motors and components.		
16.13 Remove and replace motor and component.		
16.14 Troubleshoot heating elements.		
16.15 Remove and replace heating element.		
16.16 Troubleshoot relays.		
16.17 Remove and replace relay.		
16.18 Troubleshoot water valves and components.		
16.19 Remove and replace water valve or component.		
16.20 Troubleshoot hoses.		
16.21 Remove and replace hoses.		
16.22 Troubleshoot pumps and components.		
16.23 Remove and replace pump or component.		
16.24 Troubleshoot seals.		
16.25 Remove and replace seals.		
16.26 Troubleshoot dispensers and components.		
16.27 Remove and replace dispenser or component.		
16.28 Troubleshoot spray arms.		
16.29 Remove and replace spray arm.		
16.30 Troubleshoot blower motors.		
16.31 Remove and replace blower motor.		
16.32 Troubleshoot thermostats.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.33 Remove and replace thermostat.		
16.34 Perform operational check.		
16.35 Instruct consumer on use and care.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 8**
Course Number: **8706080**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in basic refrigeration.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.0 Utilize the fundamentals of refrigeration--The student will be able to:		
17.01 Explain commonly used terms.		
17.02 Perform heat transfer, measuring and temperature conversions.		
17.03 Perform pressure measuring and conversion calculations.		
17.04 Explain the concept of state of matter.		
17.05 Explain the differences in refrigerants and their uses.		
17.06 Diagram and explain the functions of the components of basic refrigeration systems.		
17.07 Identify purpose and importance of CFC recover/recycling.		
17.08 Identify operation of recovery system components.		
17.09 Recover and recycle refrigerants.		
18.0 Work with tubing and fittings--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.01 Identify types and uses of solders and brazing alloys.		
18.02 Identify types and sizes of tubing and fittings.		
18.03 Measure, cut, flare, swage and bend tubing.		
18.04 Soft solder with acetylene.		
18.05 Braze with acetylene and oxyacetylene.		
18.06 Fabricate replacement sections of tubing for appliances.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 9**
Course Number: **8706090**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing icemakers and freezers.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
19.0	Install, troubleshoot, and repair refrigeration icemakers and freezers--The student will be able to:		
19.01	Install a refrigerator and a freezer.		
19.02	Identify components, electronic controls, variable speed compressors and their functions.		
19.03	Read and interpret schematics and diagrams.		
19.04	Troubleshoot gaskets and seals.		
19.05	Remove and replace gaskets and seals.		
19.06	Troubleshoot light and fan switches.		
19.07	Remove and replace light and fan switches.		
19.08	Troubleshoot fans.		
19.09	Remove and replace fans.		
19.10	Troubleshoot the manual and electronic adaptive controls defrost timers.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.11 Remove and replace the manual and electronic adaptive control defrost timers.		
19.12 Troubleshoot the defrost thermostats and thermistors.		
19.13 Remove and replace the defrost thermostats and thermistors.		
19.14 Troubleshoot the defrost heater.		
19.15 Remove and replace the defrost heater.		
19.16 Troubleshoot the cold control.		
19.17 Remove and replace cold control.		
19.18 Troubleshoot icemakers.		
19.19 Remove and repair icemakers.		
19.20 Use test equipment to determine operating conditions of a refrigeration system.		
19.21 Troubleshoot refrigeration system.		
19.22 Remove and replace compressors.		
19.23 Remove and replace condensers, evaporators, metering devices and dryers.		
19.24 Perform operational check.		
19.25 Instruct consumers on use and care.		

Florida Department of Education
Student Performance Standards

Course Title: **Residential Appliance and Refrigeration Repair 10**
Course Number: **8706100**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in installing, troubleshooting and repairing window air conditioners.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.0 Install, troubleshoot, and repair window air conditioners-–The student will be able to:		
20.01 Install a window air conditioner.		
20.02 Identify components and their functions to include multi-split systems and electronic controls.		
20.03 Read and interpret schematics and diagrams.		
20.04 Troubleshoot selector switches.		
20.05 Remove and replace selector switches.		
20.06 Troubleshoot the thermostats.		
20.07 Remove and replace the thermostats.		
20.08 Troubleshoot capacitors.		
20.09 Remove and replace capacitors.		
20.10 Troubleshoot the fan motor.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.11 Remove and replace the fan motor.		
20.12 Troubleshoot the heater.		
20.13 Remove and replace the heater.		
20.14 Troubleshoot the deicer.		
20.15 Remove and replace the deicer.		
20.16 Troubleshoot the reversing valve.		
20.17 Remove and replace the reversing valve.		
20.18 Troubleshoot the compressor.		
20.19 Remove and replace the compressor.		
20.20 Use test equipment to determine operating conditions of refrigeration systems.		
20.21 Perform operational check.		
20.22 Instruct consumer on use and care.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Major Appliance and Refrigeration Repair programs:

Major Appliance and Refrigeration Repair - I470106 (0647010601)
Major Appliance and Refrigeration Repair 1 - J620100 (0647010602)
Major Appliance and Refrigeration Repair 2 - J620200 (0647010603)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Boatbuilding - Wood and Fabricated**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8721000
CIP Number	0648079901
Grade Level	9-12, 30, 31
Standard Length	9 credits
Teacher Certification	CAB WOODWK @7 7G CARPENTRY @7 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	51-2091 – Fiberglass Laminators and Fabricators 51-7099 – Woodworkers, All Other
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in boatbuilding positions.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, fiberglass and marine working skills, mechanical systems, piping systems, electrical systems, and frame and form building. A program may be structured to emphasize either wood or fabricated boatbuilding but does not have to cover both areas comprehensively.

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 six occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
A	8721010 8721020	Boatbuilding - Wood and Fabricated 1 Boatbuilding - Wood and Fabricated 2	1 credit 1 credit	51-2091	2 2
B	8721030 8721040	Boatbuilding - Wood and Fabricated 3 Boatbuilding - Wood and Fabricated 4	1 credit 1 credit	51-2091	2 2
C	8721050	Boatbuilding - Wood and Fabricated 5	1 credit	51-2091	2
D	8721060	Boatbuilding - Wood and Fabricated 6	1 credit	51-7099	2
E	8721070	Boatbuilding - Wood and Fabricated 7	1 credit	51-7099	2
F	8721080 8721090	Boatbuilding - Wood and Fabricated 8 Boatbuilding - Wood and Fabricated 9	1 credit 1 credit	51-7099	2 2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Boatbuilding - Wood and Fabricated 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Boatbuilding - Wood and Fabricated 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boatbuilding - Wood and Fabricated 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
04.0 Apply trade-accepted terminology and safety.
05.0 Perform hand lamination operations
06.0 Perform plug construction operations.
07.0 Perform plug finishing operations.
08.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
09.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
10.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.
11.0 Construct molds.
12.0 Repair fiberglass.
13.0 Repair gelcoat.
14.0 Perform fiberglass fabrication operations.
15.0 Perform assembly woodworking operations.
16.0 Perform framing operations.
17.0 Perform millwork operations.
18.0 Perform trim operations.
19.0 Repair wooden boats.
20.0 Apply paint.
21.0 Install mechanical systems.
22.0 Install piping systems.
23.0 Install wiring systems.
24.0 Service mechanical systems.
25.0 Service piping and wiring systems.

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 1**
Course Number: **8721010**
Course Credit: **1**

Course Description:

This course is designed to provide an introduction of the related trade terminology and safety rules and regulations.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
01.01	Key Ideas and Details		
01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1		
01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2		
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3		
01.02	Craft and Structure		
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4		
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5		

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Apply trade-accepted terminology and safety--The student will be able to:		
04.01 Use curriculum modules.		
04.02 Clarify career values.		
04.03 Use work schedule and progress chart.		
04.04 Use marine and technical terminology.		
04.05 Apply shop safety rules.		
05.0 Perform hand lamination operations--The student will be able to:		
05.01 Properly prepare the work area		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.02 Identify tools, materials and precautions		
05.03 Lay up mat laminates.		
05.04 Lay up woven laminates.		
05.05 Lay up directional laminates.		
05.06 Apply reinforced structural bonds.		
05.07 Cut and grind laminates to specifications.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 2**
Course Number: **8721020**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in plug construction operations and plug finishing.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.0 Perform plug construction operations--The student will be able to:		
06.01 Identify components of line drawings.		
06.02 Lay down lines from offsets.		
06.03 Pick up body plan.		
06.04 Construct patterns and frames.		
06.05 Construct, fasten, and fair stringers.		
06.06 Apply planking material.		
07.0 Perform plug finishing operations--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.01 Glaze and sheath plug.		
07.02 Fill and prime plug.		
07.03 Fair plug.		
07.04 Prepare and apply finish coat.		
07.05 Polish finish coat.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 3**
Course Number: **8721030**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the techniques of constructing and using a mold for fiberglass fabrication.

Florida Standards			Correlation to CTE Program Standard #
08.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
	08.01 Key Ideas and Details		
	08.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	08.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	08.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	08.02 Craft and Structure		
	08.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	08.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	08.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
08.03	Integration of Knowledge and Ideas		
	08.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	08.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	08.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
08.04	Range of Reading and Level of Text Complexity		
	08.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	08.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
09.01	Text Types and Purposes		
	09.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	09.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	09.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
09.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	09.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	09.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	09.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
09.03	Research to Build and Present Knowledge		
	09.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	09.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	09.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
09.04	Range of Writing		
	09.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
10.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
10.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
10.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
10.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
10.04 Model with mathematics. MAFS.K12.MP.4.1	
10.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
10.06 Attend to precision. MAFS.K12.MP.6.1	
10.07 Look for and make use of structure. MAFS.K12.MP.7.1	
10.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Construct molds--The student will be able to:		
11.01 Prepare plug for mold lamination.		
11.02 Gel and skin mold.		
11.03 Laminate mold.		
11.04 Brace and pull mold.		
11.05 Prepare mold for first use.		
11.06 Construct molds for vacuum infusion.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 4**
Course Number: **8721040**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the repair of fiberglass and gelcoats and the basic science underlying the process.

Florida Standards			Correlation to CTE Program Standard #
08.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
	08.01 Key Ideas and Details		
	08.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	08.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	08.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	08.02 Craft and Structure		
	08.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	08.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	08.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
08.03	Integration of Knowledge and Ideas		
	08.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	08.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	08.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
08.04	Range of Reading and Level of Text Complexity		
	08.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	08.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
09.01	Text Types and Purposes		
	09.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	09.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	09.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
09.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	09.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	09.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	09.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
09.03	Research to Build and Present Knowledge		
	09.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	09.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	09.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
09.04	Range of Writing		
	09.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
10.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boatbuilding - Wood and Fabricated.		
10.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
10.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
10.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
10.04 Model with mathematics. MAFS.K12.MP.4.1	
10.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
10.06 Attend to precision. MAFS.K12.MP.6.1	
10.07 Look for and make use of structure. MAFS.K12.MP.7.1	
10.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.0 Repair fiberglass--The student will be able to:		
12.01 Install point loads and stiffeners.		
12.02 Repair laminates.		
12.03 Renew bottom paint.		
12.04 Perform composite laminate repairs		
13.0 Repair gelcoat--The student will be able to:		
13.01 Identify tools, materials and precautions.		
13.02 Sand and buff gelcoat.		
13.03 Repair gelcoat with putty.		
13.04 Repair gelcoat with spray equipment.		
13.05 Maintain spray equipment.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 5**
Course Number: **8721050**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in fiberglass fabrication operations and communication skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.0 Perform fiberglass fabrication operations--The student will be able to:		
14.01 Operate chop gun.		
14.02 Prepare and apply bonding putty.		
14.03 Identify and apply core materials.		
14.04 Fabricate parts by vacuum molding.		
14.05 Prepare mold for gelcoat.		
14.06 Operate gel gun.		
14.07 Pull parts.		
14.08 Repair molds.		
14.09 Maintain molds.		
14.10 Repair and maintain gel and chopper guns as well as safety equipment.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 6**
Course Number: **8721060**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the tools methods and techniques of boat maintenance repairing of gelcoat, fiberglass wood and metal boat repair.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Perform assembly woodworking operations--The student will be able to:		
15.01 Level hull and set up crossbeams.		
15.02 Fabricate and install sub-sole components.		
15.03 Fabricate and install sole.		
15.04 Construct router, shaper, and tracing patterns.		
15.05 Cut bulkheads from patterns.		
15.06 Construct straight moldings and posts.		
15.07 Construct turned corner moldings and posts.		
15.08 Construct solid and laminated curved moldings.		
15.09 Construct curved moldings and parts.		
16.0 Perform framing operations--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.01 Use frame plans and tools.		
16.02 Layout dimensions from plans.		
16.03 Fit bulkheads.		
16.04 Fit faces and tops.		
17.0 Perform millwork operations--The student will be able to:		
17.01 Operate router and shaper.		
17.02 Operate table saw and radial arm saw.		
17.03 Fabricate cabinetry from plans.		
17.04 Apply plastic laminates to cabinetry.		
17.05 Operate jointer and surface planer.		
17.06 Operate band saw.		
18.0 Perform trim operations--The student will be able to:		
18.01 Identify tools and precautions.		
18.02 Identify and apply flat trim moldings.		
18.03 Identify and apply cap and corner moldings.		
18.04 Hang compartment door.		
18.05 Install hull-side paneling.		
18.06 Install cabinet doors and drawers.		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 7**
Course Number: **8721070**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the tools methods and techniques of boat maintenance repairing of wooden boats, fiberglass wood and metal boat repair.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Repair wooden boats--The student will be able to:		
19.01 Identify wooden boat construction types.		
19.02 Repair plank-on-frame construction.		
19.03 Use epoxy resin in restoration/repair.		
19.04 Maintain wooden boats.		
20.0 Apply paint--The student will be able to:		
20.01 Identify materials and precautions.		
20.02 Repair/prepare surface.		
20.03 Apply and prepare primer.		
20.04 Apply masking and pull tapes.		
20.05 Apply paint with spray equipment.		
20.06 Maintain equipment		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 8**
Course Number: **8721080**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the tools, methods and techniques to install mechanical systems, piping systems and wiring.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Install mechanical systems--The student will be able to:		
21.01 Identify tools and precautions.		
21.02 Fabricate and install machinery foundations.		
21.03 Install engine and shaft line.		
21.04 Install mechanical and hydraulic steering.		
21.05 Install deck hardware.		
21.06 Understand design blueprints		
22.0 Install piping systems--The student will be able to:		
22.01 Identify tools, materials, and precautions.		
22.02 Install through-hull devices.		
22.03 Install bilge pump.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.04 Install tank supports and tank.		
22.05 Install hand pump water system.		
22.06 Install pressurized water system.		
22.07 Install PVC-slip drain system.		
22.08 Install engine cooling and exhaust.		
22.09 Install fuel systems.		
22.10 Install and understand check valves		
23.0 Install wiring systems--The student will be able to:		
23.01 Identify tools, materials, and precautions.		
23.02 Install batteries.		
23.03 Select DC conductor size.		
23.04 Install DC service equipment.		
23.05 Install DC lighting and motor circuits.		
23.06 Install starting and charging circuits.		
23.07 Install bonding and cathodic protection.		
23.08 Install AC service equipment.		
23.09 Install AC lighting and receptacle circuits.		
23.10 Install on-board generator.		
23.11 Use Multi-meter to check AC, DC, and bonding circuits		

Florida Department of Education
Student Performance Standards

Course Title: **Boatbuilding - Wood and Fabricated 9**
Course Number: **8721090**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the tools, methods and techniques of boat maintenance servicing mechanical systems, and piping and wiring systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
24.0 Service mechanical systems--The student will be able to:		
24.01 Perform routine engine service.		
24.02 Maintain hydraulic steering systems.		
24.03 Repair and maintain mechanical steering.		
24.04 Inspect mast, boom, and rigging.		
24.05 Repair rigging.		
25.0 Service piping and wiring systems--The student will be able to:		
25.01 Maintain and repair portable water systems.		
25.02 Maintain and repair fuel systems.		
25.03 Install and maintain sewage systems.		
25.04 Troubleshoot DC systems.		
25.05 Troubleshoot AC systems.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Electronic Technology**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8730000
CIP Number	0615030300
Grade Level	9-12, 30, 31
Standard Length	10 credits
Teacher Certification	ELECTRONIC @7 7G TEC ELEC @7 7G AVIONICS @7 7G RADIO TV 7G TV PROD TEC @7 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	17-3023 – Electrical and Electronic Engineering Technicians 49-2094 – Electrical and Electronics Repairers, Commercial and Industrial Equipment 51-2022 – Electrical and Electronic Equipment Assemblers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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

manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in electronic support services positions.

The content includes but is not limited to direct current (DC) circuits, alternating current (AC) circuits and analog circuits; solid state and digital devices; microprocessors; use of circuit diagrams and schematics; soldering and chassis assembly techniques; laboratory practices; and technical recording and reporting.

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 four occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8730010	Electronic 1	1 credit		2
A	8730020	Electronic 2	1 credit	51-2022	3
	8730030	Electronic 3	1 credit		3
	8730040	Electronic 4	1 credit		3
B	8730050	Electronic 5	1 credit	51-2022	3
	8730060	Electronic 6	1 credit		3
C	8730070	Electronic 7	1 credit	49-2094	3
	8730080	Electronic 8	1 credit		3
	8730090	Electronic 9	1 credit		3
D	8730091	Electronic 10	1 credit	17-3023	3

Academic Alignment Table

Some or all of the courses in this program have been academically aligned to the Florida Standards for Mathematics and the Next Generation Sunshine State Standards (NGSSS) for Science. The table below contains the results of the alignment efforts by both academic core and Career and Technical Education (CTE) professional educators. Data shown in the table includes the number of academic standards in the CTE course and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Electronic 1	^^	^^	^^	4/53 8%	9/52 17%	5/56 9%	9/55 16%	8/58 14%	5/35 14%	9/42 21%	13/56 23%	15/53 28%
Electronic 2	^^	^^	^^	4/53 8%	11/52 21%	5/56 9%	12/55 21%	11/58 19%	5/35 14%	8/42 19%	14/56 25%	15/53 28%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Electronic 3	^^	^^	^^	4/53 8%	14/52 27%	5/56 9%	14/55 23%	14/58 24%	5/35 14%	9/42 21%	18/56 32%	21/53 40%
Electronic 4	^^	^^	^^	4/53 8%	13/52 25%	5/56 9%	10/55 18%	11/58 19%	5/35 14%	10/42 24%	13/56 23%	15/53 28%
Electronic 5	^^	^^	^^	4/53 8%	9/52 17%	5/56 9%	9/55 16%	10/58 17%	5/35 14%	8/42 19%	9/56 16%	9/53 17%
Electronic 6	^^	^^	^^	#	#	#	#	#	#	#	#	#
Electronic 7	^^	^^	^^	1/53 2%	2/52 4%	2/56 4%	3/55 5%	1/58 2%	1/35 3%	1/42 2%	4/56 7%	6/53 11%
Electronic 8	^^	^^	^^	4/53 8%	12/52 23%	5/56 9%	9/55 16%	11/58 19%	5/35 14%	9/42 21%	12/56 21%	14/53 26%
Electronic 9	^^	^^	^^	1/53 2%	3/52 6%	2/56 4%	1/55 2%	2/58 3%	1/35 3%	3/42 7%	4/56 7%	3/53 6%
Electronic 10	^^	^^	^^	4/53 8%	13/52 25%	5/56 9%	9/55 16%	12/58 21%	5/35 14%	9/42 21%	13/56 23%	15/53 28%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic Technology.
04.0 Demonstrate proficiency in soldering and basic laboratory practices.
05.0 Demonstrate proficiency in basic DC circuits.
06.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronic Technology.
07.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronic Technology.
08.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronic Technology.
09.0 Demonstrate proficiency in advanced DC circuits.
10.0 Demonstrate proficiency in AC circuits.
11.0 Demonstrate proficiency in solid state devices.
12.0 Demonstrate proficiency in digital circuits.
13.0 Demonstrate proficiency in fundamental micro-processors.
14.0 Demonstrate skills in technical recording utilizing industry recognized computer application software.
15.0 Demonstrate proficiency in analog circuits.

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 1**
Course Number: **8730010**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in the different procedures for developing proficiency in laboratory practices.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Demonstrate proficiency in soldering basic laboratory practices--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5 SC.912.P.10.2,3,4,13 14,15,17	
04.01 Apply proper Occupational Safety Health Administration (OSHA) safety standards.			
04.02 Make electrical connections.			
04.03 Identify and use hand tools properly.			
04.04 Identify and use power tools properly.			
04.05 Apply recognized industry accepted standard soldering techniques.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
04.06	Apply recognized industry accepted standard desoldering techniques.			
04.07	Apply recognized industry accepted standard electrostatic discharge (ESD) safety procedures.			
04.08	Design and/or construct printed circuit boards (PCB's) to industry accepted standards			
04.09	Explain the theoretical concepts of industry accepted soldering techniques.			
04.10	Apply recognized industry accepted standard techniques for rework and repair.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 2**
Course Number: **8730020**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in DC circuits.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic Technology.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
05.0 Demonstrate proficiency in basic DC circuits--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5; SC.912.P.8.1,3,4 SC.912.P.10.1,3,4,15	
05.01 Demonstrate proficiency in basic DC circuits.			
05.02 Solve problems in electronic units utilizing metric prefixes.			
05.03 Identify sources of electricity.			
05.04 Define voltage, current, resistance, power and energy.			
05.05 Apply Ohm's law and power formulas.			
05.06 Read and interpret color codes and symbols to identify electrical components and values.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
05.07 Measure properties of a circuit using a digital multi-meter (DMM).			
05.08 Compute conductance and compute and measure resistance of conductors and insulators.			
05.09 Apply Ohm's law to series circuits.			
05.10 Construct and verify operation of series circuits.			
05.11 Analyze and troubleshoot series circuits.			
05.12 Apply Ohm's law to parallel circuits.			
05.13 Construct and verify the operation of parallel circuits.			
05.14 Analyze and troubleshoot parallel circuits.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 3**
Course Number: **8730030**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in basic computer usage and advanced DC circuits.

Florida Standards			Correlation to CTE Program Standard #
06.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronic Technology.		
	06.01 Key Ideas and Details		
	06.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	06.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	06.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	06.02 Craft and Structure		
	06.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	06.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	06.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
06.03	Integration of Knowledge and Ideas		
	06.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	06.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	06.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
06.04	Range of Reading and Level of Text Complexity		
	06.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	06.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
07.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronic Technology.		
07.01	Text Types and Purposes		
	07.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	07.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	07.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
07.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	07.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	07.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	07.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
07.03	Research to Build and Present Knowledge		
	07.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	07.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	07.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
07.04	Range of Writing		
	07.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronic Technology.		
08.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
08.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
08.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
08.04 Model with mathematics. MAFS.K12.MP.4.1	
08.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
08.06 Attend to precision. MAFS.K12.MP.6.1	
08.07 Look for and make use of structure. MAFS.K12.MP.7.1	
08.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
09.0 Demonstrate proficiency in advanced DC circuits--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5; SC.912.P.8.1,3,4 SC.912.P.10.1,2,3,4, 13,14,15,16,17,18,20 ,21 SC.912.P.12.7,9	
09.01 Solve algebraic problems to include exponentials to DC.			
09.02 Describe the relationship of DC electricity to the nature of matter.			
09.03 Apply Ohm's law to series-parallel and parallel-series circuits.			
09.04 Construct and verify the operation of series-parallel and parallel-series and bridge circuits.			
09.05 Troubleshoot series-parallel and parallel-series and bridge circuits.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
09.06	Identify and define voltage divider circuits (loaded and unloaded).			
09.07	Construct and verify the operation of voltage divider circuits (loaded and unloaded).			
09.08	Analyze and troubleshoot voltage divider circuits (loaded and unloaded).			
09.09	Apply maximum power transfer theorem.			
09.10	Construct and verify the operation of DC circuits that demonstrate the maximum power transfer theory.			
09.11	Describe magnetic properties of circuits and devices.			
09.12	Determine the physical and electrical characteristics of capacitors and inductors.			
09.13	Define resistor-capacitor (R-C) and resistor-inductor (R-L) time constants and classify the output of differentiators and integrators.			
09.14	Set up and operate power supplies for DC circuits.			
09.15	Explain the theory of DC motor operation.			
09.16	Identify the practical applications for the use of a DC motor.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 4**
Course Number: **8730040**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in advanced DC circuits and AC circuits.

Florida Standards			Correlation to CTE Program Standard #
06.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronic Technology.		
	06.01 Key Ideas and Details		
	06.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	06.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	06.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	06.02 Craft and Structure		
	06.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	06.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	06.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
06.03	Integration of Knowledge and Ideas		
	06.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	06.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	06.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
06.04	Range of Reading and Level of Text Complexity		
	06.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	06.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
07.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronic Technology.		
07.01	Text Types and Purposes		
	07.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	07.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	07.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
07.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	07.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	07.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	07.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	07.03	Research to Build and Present Knowledge	
	07.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	07.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	07.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	07.04	Range of Writing	
	07.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronic Technology.		
	08.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
08.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
08.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
08.04 Model with mathematics. MAFS.K12.MP.4.1	
08.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
08.06 Attend to precision. MAFS.K12.MP.6.1	
08.07 Look for and make use of structure. MAFS.K12.MP.7.1	
08.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
10.0 Demonstrate proficiency in AC circuits--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5 SC.912.P.10.15,16, 17, 18, 20, 21 SC.912.P.12.9	
10.01 Solve basic trigonometric problem as applicable to electronics.			
10.02 Define the characteristics of AC capacitive circuits.			
10.03 Construct and verify the operation of AC capacitive circuits.			
10.04 Analyze and troubleshoot AC capacitive circuits.			
10.05 Define the characteristics of AC inductive circuits.			
10.06 Construct and verify the operation of AC inductive circuits.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
10.07 Analyze and troubleshoot AC inductive circuits.			
10.08 Define and apply the principles of transformers to AC circuits.			
10.09 Construct and verify the operation of AC circuits utilizing transformers.			
10.10 Analyze and troubleshoot AC circuits utilizing transformers.			
10.11 Construct and verify the operation of differentiators and integrators to determine R-C and R-L time constraints.			
10.12 Analyze and troubleshoot differentiator and integrator circuits.			
10.13 Define the characteristics of Resistive, Inductive, and Capacitive (RLC) circuits (series, parallel and complex).			
10.14 Construct and verify the operation of series and parallel resonant circuits.			
10.15 Define the characteristics of series and parallel resonant circuits.			
10.16 Construct and verify the operation of series and parallel resonant circuits.			
10.17 Analyze and troubleshoot R-C, R-L, and RLC circuits.			
10.18 Define the characteristics of frequency selective filter circuits.			
10.19 Construct and verify the operation of frequency selective filter circuits.			
10.20 Analyze and troubleshoot frequency selective filter circuits.			
10.21 Define the characteristics of polyphase circuits.			
10.22 Define basic motor theory and operation.			
10.23 Define basic generator theory and operation.			
10.24 Set up and operate power supplies for AC circuits.			
10.25 Set up and operate oscilloscopes for AC circuits.			
10.26 Set up and operate function generators for AC circuits.			
10.27 Analyze and measure power in AC circuits.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
10.28 Set up and operate capacitor and inductor analyzers for AC circuits.			
10.29 Explain the theory of AC motor operation.			
10.30 Identify the practical applications for the use of an AC motor.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 5**
Course Number: **8730050**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in advanced AC circuits and solid state devices.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
11.0	Demonstrate proficiency in solid state devices--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5 SC.912.P.10.18	
11.01	Identify and define properties of semiconductor materials.			
11.02	Identify and define operating characteristics and applications of junction diodes.			
11.03	Identify and define operating characteristics and applications of special diodes, ex. Zener diodes.			
11.04	Construct diode circuits.			
11.05	Analyze and troubleshoot diode circuits.			
11.06	Identify and define operating characteristics and applications of bipolar transistors.			
11.07	Identify and define operating characteristics and applications of field effect transistors.			
11.08	Identify and define operating characteristics and applications of single-stage amplifiers.			
11.09	Construct single-stage amplifiers.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
11.10 Analyze and troubleshoot single-stage amplifiers.			
11.11 Construct thyristor circuitry.			
11.12 Analyze and troubleshoot thyristor circuitry.			
11.13 Set up and operate power supplies for solid-state devices.			
11.14 Set up and operate oscilloscopes for solid-state devices			
11.15 Set up and operate function generators for solid-state devices.			
11.16 Set up and operate capacitor and inductor analyzers for solid-state devices.			
11.17 Set up and operate curve tracers.			
11.18 Set up and operate transistor testers.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 6**
Course Number: **8730060**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in developing proficiency in digital circuit skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
12.0 Demonstrate proficiency in digital circuits--The student will be able to:			
12.01 Define and apply numbering systems to codes and arithmetic operations.			
12.02 Analyze and minimize logic circuits using Boolean operations.			
12.03 Set up and operate logic probes for digital circuits.			
12.04 Set up and operate power supplies for digital circuits and solve power distribution and noise problems.			
12.05 Set up and operate pulsers for digital circuits.			
12.06 Set up and operate oscilloscopes for digital circuits.			
12.07 Set up and operate logic analyzers for digital circuits			
12.08 Set up and operate pulse generators for digital circuits.			
12.09 Identify types of logic gates and their truth tables.			
12.10 Construct combinational logic circuits using integrated circuits.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
12.11 Troubleshoot logic circuits.			
12.12 Analyze types of flip-flops and their truth tables.			
12.13 Construct flip-flops using integrated circuits.			
12.14 Troubleshoot flip-flops.			
12.15 Identify, define and measure characteristics of integrated circuit (IC) logic families.			
12.16 Identify types of registers and counters.			
12.17 Construct registers and counters using flip-flops and logic gates.			
12.18 Troubleshoot registers and counters.			
12.19 Analyze clock and timing circuits.			
12.20 Construct clock and timing circuits.			
12.21 Troubleshoot clock and timing circuits.			
12.22 Identify types of arithmetic-logic circuits.			
12.23 Construct arithmetic-logic circuits.			
12.24 Troubleshoot arithmetic-logic circuits.			
12.25 Identify types of encoding and decoding devices.			
12.26 Construct encoders and decoders.			
12.27 Troubleshoot encoders and decoders.			
12.28 Identify types of multiplexer and demultiplexer circuits.			
12.29 Construct multiplexer and demultiplexer circuits using integrated circuits.			
12.30 Troubleshoot multiplexer and demultiplexer circuits.			
12.31 Identify types of memory circuits.			
12.32 Relate the uses of digital-to-analog and analog-to-digital conversions.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
12.33 Construct digital-to-analog and analog-to-digital circuits.			
12.34 Troubleshoot digital-to-analog and analog-to-digital circuits.			
12.35 Identify types of digital displays.			
12.36 Construct digital display circuits.			
12.37 Troubleshoot digital display circuits.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 7**
Course Number: **8730070**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in developing proficiency in fundamental microprocessors.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
13.0 Demonstrate proficiency in fundamental micro-processors--The student will be able to:		SC.912.N.1.1 SC.912.P.10.13,15, 18,20,21	
13.01 Identify central processing unit (CPU) building blocks and their uses (architecture).			
13.02 Safely install and remove a CPU without damaging.			
13.03 Analyze bus concepts.			
13.04 Analyze various memory schemes.			
13.05 Use memory devices in circuits.			
13.06 Troubleshoot memory device circuits.			
13.07 Set up and operate oscilloscopes for microprocessor systems.			
13.08 Set up and operate logic-data analyzers to troubleshoot microprocessor systems.			
13.09 Identify types of input and output devices and peripherals.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
13.10 Interface input and output ports to peripherals.			
13.11 Analyze and troubleshoot input and output ports.			
13.12 Compare and contrast macro processor programming language types.			
13.13 Diagram the macro processor programming sequence using a flow chart.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 8**
Course Number: **8730080**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in developing proficiency in analog circuits, technical recording and electronics related mathematics.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
14.0 Demonstrate skills in technical recording utilizing industry recognized computer application software--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5 SC.912.P.10.14,15,16,17,18,20,21 SC.912.P.12.9	
14.01 Draw and interpret electronic schematics.			
14.02 Record data and design curves and graphs.			
14.03 Write reports and make oral presentations.			
14.04 Maintain test logs.			
14.05 Make equipment failure reports.			
14.06 Specify and requisition simple electronic components.			
14.07 Compose technical letters and memoranda.			
14.08 Write formal reports of laboratory experiences.			
14.09 Draft preventive maintenance and calibration procedures.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
15.0 Demonstrate proficiency in analog circuits--The student will be able to:			
15.01 Identify and define operational characteristics and applications of multistage amplifiers.			
15.02 Construct multistage amplifiers.			
15.03 Analyze and troubleshoot multistage amplifiers.			
15.04 Identify and define operating characteristics and applications of linear integrated circuits.			
15.05 Identify and define operating characteristics and applications of basic power supplies and filters.			
15.06 Construct basic power supplies and filters.			
15.07 Identify and define operating characteristics and applications of differential and operational amplifiers.			
15.08 Construct differential and operational amplifier circuits.			
15.09 Analyze and troubleshoot differential and operational amplifier circuits.			
15.10 Identify and define operating characteristics of audio power amplifiers.			
15.11 Construct audio power amplifiers.			
15.12 Analyze and troubleshoot audio power amplifiers.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 9**
Course Number: **8730090**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in developing proficiency in analog circuits and applied science as it relates to electronics.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
15.0 Demonstrate proficiency in analog circuits--The student will be able to:		SC.912.P.10.2	
15.13 Identify and define operating characteristics and applications of power supply regulator circuits.			
15.14 Construct power supply regulator circuits.			
15.15 Analyze and troubleshoot power supply regulator circuits.			
15.16 Identify and define operating characteristics and applications of active filters.			
15.17 Construct active filter circuits.			
15.18 Analyze and troubleshoot active filter circuits.			
15.19 Identify and define operating characteristics and applications of sinusoidal and nonsinusoidal oscillator circuits.			

Florida Department of Education
Student Performance Standards

Course Title: **Electronic 10**
Course Number: **8730091**
Course Credit: **1**

Course Description:

This course is designed to provide instruction in developing proficiency in analog circuits.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
15.0 Demonstrate proficiency in analog circuits--The student will be able to:	MAFS.912.N-Q.1.3 MAFS.912.S-IC.2	SC.912.N.1.1,2,4,6,7 SC.912.N.3.5 SC.912.P.10.14,15,16,17,18,20,21 SC.912.P.12.7,9	
15.20 Construct oscillator circuits.			
15.21 Analyze and troubleshoot oscillator circuits.			
15.22 Identify and define operating characteristics and applications of Liquid Crystal Display (LCD), Light Emitting Diode (LED), and Three Dimensional (3D) technologies.			
15.23 Identify and define operating characteristics and applications of optoelectronic devices.			
15.24 Set up and operate measuring instruments for analog circuits.			

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Electronic Technology programs:

Electronic Technology - I150303 (0615030300)
Electronic Technology 1 - J540100 (0615030315)
Electronic Technology 2 - J540200 (0615030316)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Electronic System Assembly**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8730300
CIP Number	0647019903
Grade Level	9-12, 30, 31
Standard Length	3 credits
Teacher Certification	ELECTRONIC @7 7G TEC ELEC @7 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	51-2022 – Electrical and Electronic Equipment Assemblers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in Electronic System Assembly positions.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, blueprint reading, selection and use of tools/materials, wire preparation for soldering, soldering skills, types of circuit boards, types of terminals, types of solder cups, component assembly, and solderless connections.

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 one occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8730310	Electronic System Assembly 1	1 credit		2
	8730320	Electronic System Assembly 2	1 credit		2
A	8730330	Electronic System Assembly 3	1 credit	51-2022	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Electronic System Assembly 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Electronic System Assembly 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Electronic System Assembly 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and

technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic System Assembly.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic System Assembly.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic System Assembly.
04.0 Demonstrate proficiency in interpreting written, graphic and/or oral instruction.
05.0 Demonstrate proficiency in developing basic electronic assembly skills.
06.0 Demonstrate proficiency in preparing wire for soldering and/or assembly.
07.0 Demonstrate proficiency in applying soldering techniques.
08.0 Demonstrate proficiency in connecting component and lead wires.
09.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronic System Assembly.
10.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronic System Assembly.
11.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronic System Assembly.
12.0 Demonstrate proficiency in installing electronic component assembly.
13.0 Demonstrate proficiency in preparing material for solderless connections.

Florida Department of Education
Student Performance Standards

Course Title: **Electronic System Assembly 1**
Course Number: **8730310**
Course Credit: **1**

Course Description:

This course includes instruction in basic electronics and interpreting instructions.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic System Assembly.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic System Assembly.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic System Assembly.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate proficiency in interpreting written, graphic and/or oral instruction--The student will be able to:		
04.01 Read and interpret written and oral instructions.		
04.02 Read and interpret graphic instructions.		
04.03 Follow accepted safety rules.		
04.04 Read and interpret electronic chassis assembly.		
04.05 Read and interpret color coding.		
05.0 Demonstrate proficiency in developing basic electronic assembly skills--The student will be able to:		
05.01 Use hand tools.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.02 Use mechanical and other strippers.		
05.03 Use soldering irons.		
05.04 Select soldering materials.		
05.05 Select types of wire.		
05.06 Identify and select electronic component parts.		
05.07 Select types of terminals.		
05.08 Select types of cleaning tools and materials.		
05.09 Use desoldering tools.		

Florida Department of Education
Student Performance Standards

Course Title: **Electronic System Assembly 2**
Course Number: **8730320**
Course Credit: **1**

Course Description:

This course includes instruction in wire soldering, soldering techniques and connecting lead wires.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Electronic System Assembly.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Electronic System Assembly.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Electronic System Assembly.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.0 Demonstrate proficiency in preparing wire for soldering and/or assembly--The student will be able to:		
06.01 Strip wires for soldering.		
06.02 Tin by hand and/or solder pot.		
07.0 Demonstrate proficiency in applying soldering techniques--The student will be able to:		
07.01 Apply heat applications.		
07.02 Apply solder applications.		
07.03 Rework unsatisfactory connectors.		
07.04 Maintain solder connection appearance.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Demonstrate proficiency in connecting component and lead wires--The student will be able to:		
08.01 Solder component leads to printed circuit boards.		
08.02 Solder component lead wires to turret terminals.		
08.03 Solder lead wires to bifurcated terminals.		
08.04 Solder lead wires to hook and perforated terminals.		
08.05 Solder lead wires into connector solder cups.		

Florida Department of Education
Student Performance Standards

Course Title: **Electronic System Assembly 3**
Course Number: **8730330**
Course Credit: **1**

Course Description:

This course includes instruction in installation of electronic components, and making solderless connections.

Florida Standards			Correlation to CTE Program Standard #
09.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Electronic System Assembly.		
	09.01 Key Ideas and Details		
	09.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	09.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	09.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	09.02 Craft and Structure		
	09.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	09.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	09.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
09.03	Integration of Knowledge and Ideas		
	09.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	09.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	09.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
09.04	Range of Reading and Level of Text Complexity		
	09.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	09.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
10.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Electronic System Assembly.		
10.01	Text Types and Purposes		
	10.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	10.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	10.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
10.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	10.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	10.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	10.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
10.03	Research to Build and Present Knowledge		
	10.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	10.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	10.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
10.04	Range of Writing		
	10.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
11.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Electronic System Assembly.		
11.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
11.02	Reason abstractly and quantitatively.		

Florida Standards	Correlation to CTE Program Standard #
MAFS.K12.MP.2.1	
11.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
11.04 Model with mathematics. MAFS.K12.MP.4.1	
11.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
11.06 Attend to precision. MAFS.K12.MP.6.1	
11.07 Look for and make use of structure. MAFS.K12.MP.7.1	
11.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.0 Demonstrate proficiency in installing electronic component assembly--The student will be able to:		
12.01 Mount components onto a chassis.		
12.02 Mount components onto a panel.		
12.03 Mount components onto a circuit board.		
13.0 Demonstrate proficiency in preparing materials for solderless connections--The student will be able to:		
13.01 Prepare wire for cables.		
13.02 Strip, terminalize, lay and lace harness.		
13.03 Use heat shrinkable tubing.		
13.04 Strip wires for wrapping.		
13.05 Route and wrap for pin connections.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Industrial Biotechnology**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8736000
CIP Number	0626061601
Grade Level	9-12, 30, 31
Standard Length	3 credits
Teacher Certification	BIOLOGY & BIOTECHNICIAN 7G or CHEMISTRY & BIOTECHNICIAN 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	19-4021 – Biological Technicians
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

Industrial Biotechnology is a program offering students science credit through an applied science education, to prepare them for entry level positions in the cutting edge industry of Biotechnology. While meeting the state standards for science, the coursework will focus on developing science and bio-technical skills that are current and in demand for this rapidly growing occupation.

Upon completion of the integrated program, students will be able to explain and perform bio-technical skills used by Industrial, Medical, Agricultural, and Research facilities that develop and produce marketable products and processes.

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 three occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
A	3027010	Biotechnology 1	1 credit	19-4021	3
B	3027020	Biotechnology 2	1 credit	19-4021	3
C	8736030	Biotechnology 3	1 credit	19-4021	3

Academic Alignment Table

Some or all of the courses in this program have been academically aligned to the Florida Standards for Mathematics and the Next Generation Sunshine State Standards (NGSSS) for Science. The table below contains the results of the alignment efforts by both academic core and Career and Technical Education (CTE) professional educators. Data shown in the table includes the number of academic standards in the CTE course and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Biotechnology 1	^^	^^	^^	9/53 17%	15/52 29%	31/56 55%	23/55 42%	14/58 24%	27/35 77%	15/42 36%	21/56 38%	15/53 28%
Biotechnology 2	^^	^^	^^	6/53 11%	5/52 10%	21/56 38%	11/55 20%	5/58 9%	12/35 34%	12/42 29%	10/56 18%	6/53 11%
Biotechnology 3	^^	^^	^^	10/53 19%	22/52 42%	30/56 54%	24/55 44%	12/58 21%	19/35 54%	18/42 43%	29/56 52%	16/53 30%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Biotechnology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Biotechnology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Biotechnology.

Academic Knowledge Standards:

04.0 Apply knowledge of the nature of science and scientific habits of mind to solve problems, and employ safe and effective use of laboratory technologies.
05.0 Demonstrate understanding of the roles of matter, energy, in the chemical processes of cells, organisms.
06.0 Demonstrate an understanding of the structure and processes of the cell, with emphasis on reproduction and communication.
07.0 Demonstrate an understanding of the fundamentals of biochemistry including protein synthesis and reproduction.
08.0 Demonstrate an understanding of genetics, including the principles of, molecular basis, diversity, and applications to biotechnology.
09.0 Demonstrate an understanding of the levels of organization, from atoms to molecular DNA to organisms, classification, taxonomy.
10.0 Demonstrate an understanding of the interdependence of organisms, humans, and the environment.
11.0 Demonstrate an understanding of genetic diversity, selection, adaptations, and changes through time.
12.0 Demonstrate an understanding of the legal and ethical responsibilities associated with working with biological specimens for research or industry, bioethics.
13.0 Demonstrate an understanding of the connection between biotechnology, agricultural, food, and medical technologies and careers.

CTE Performance Standards:

14.0 Demonstrate knowledge of the history, career fields, and benefits of biotechnology.
15.0 Recognize and practice safety procedures.
16.0 Recognize and follows quality control procedures and regulatory guidelines.
17.0 Demonstrate the ability to communicate and use interpersonal skills effectively.
18.0 Apply basic skills in scientific inquiry, calculations, and analysis.
19.0 Demonstrate knowledge of organism structure and function.
20.0 Utilize materials processing and standard laboratory operating procedures for biotechnology.
21.0 Apply biotechnical materials analysis skills.
22.0 Demonstrates knowledge of basic chemistry as applied to biotechnology procedures.
23.0 Utilizes basic knowledge of microbiology and blood-borne diseases, including AIDS.
24.0 Demonstrate knowledge of legal and ethical responsibilities.
25.0 Demonstrate literacy and computer skills applicable to the biotechnology industry.
26.0 Demonstrate employability skills.

Academic Knowledge Standards:

27.0 Apply knowledge of the nature of science and scientific habits of mind to solve problems, and employ safe and effective use of laboratory technologies.
28.0 Demonstrate understanding of the chemical processes in biotechnology, pH, solutions, dilutions, molarity.
29.0 Demonstrate an understanding of cell propagation, growth and cultures for biotechnology.
30.0 Demonstrate an understanding of the fundamentals of biochemistry including protein synthesis, recombinants, and reproduction, analysis, western blot.
31.0 Demonstrate an understanding of genetics and biotechnology, gene selection, transformation, analysis, PCR, Northern and Southern blot.
32.0 Demonstrate knowledge of the structure and function and reproduction of various organisms used as genetic models.
33.0 Demonstrate an understanding of the interdependence of organisms, humans, and the environment.
34.0 Demonstrate an understanding of genetic diversity, natural and genetic selection.
35.0 Demonstrate an understanding of bioethics.
36.0 Demonstrate and understanding of the connection between Biotechnology, agricultural, food, and medical technologies and careers.

CTE Performance Standards:

37.0 Demonstrate knowledge of the history, career fields, and benefits of biotechnology.
38.0 Recognize and practice safety procedures.
39.0 Recognize and follows quality control procedures and regulatory guidelines.
40.0 Demonstrate the ability to communicate and use interpersonal skills effectively.
41.0 Apply basic skills in scientific inquiry, calculations, and analysis.
42.0 Demonstrate knowledge of organism structure and function.
43.0 Utilize materials processing and standard laboratory operating procedures for biotechnology.
44.0 Apply biotechnical materials analysis skills.
45.0 Demonstrates knowledge of basic chemistry as applied to biotechnology procedures.
46.0 Utilizes basic knowledge of microbiology and blood-borne diseases, including AIDS.
47.0 Demonstrate knowledge of legal and ethical responsibilities.
48.0 Demonstrate literacy and computer skills applicable to the biotechnology industry.
49.0 Demonstrate employability skills.

CTE Performance Standards:

50.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Industrial Biotechnology.
51.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Industrial Biotechnology.
52.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Industrial Biotechnology.
53.0 History, career fields, and benefits of biotechnology.
54.0 Safety procedures.
55.0 Quality control procedures and regulatory guidelines.
56.0 Communicate and use interpersonal skills effectively.
57.0 Basic skills in scientific inquiry, calculations, and analysis.

58.0 Organism structure and function.
59.0 Materials processing and standard laboratory operating procedures for biotechnology.
60.0 Biotechnical materials analysis skills.
61.0 Basic chemistry as applied to biotechnology procedures.
62.0 Microbiology and blood-borne diseases, including AIDS.
63.0 Legal and ethical responsibilities.
64.0 Literacy and computer skills applicable to the biotechnology industry.
65.0 Employability skills.

Florida Department of Education
Student Performance Standards

Course Title: **Biotechnology 1**
Course Number: **3027010**
Course Credit: **1 Science**

Course Description:

This course provides exploratory experience combining laboratory and real-life applications in the field of biotechnology. The content includes, but is not limited to, the following:

- The nature of science
- Matter, energy, chemical processes of cells, organisms
- Cell molecular structure and function, membranes, DNA, plasmids, reproduction, communication
- Fundamentals of biochemistry, protein synthesis, germ theory,
- Molecular genetics and biotechnology, restriction digest, DNA analysis, PCR
- Levels of organization, molecular to organismal, classification, and taxonomy
- Interdependence of organisms, humans, and the environment,
- Genetic diversity, selection, adaptations, and changes through time
- Bioethics
- Connection between Biotechnology, agricultural, food, and medicine and careers

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Biotechnology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	

Florida Standards		Correlation to CTE Program Standard #
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure	
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas	
01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity	
01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	

Florida Standards			Correlation to CTE Program Standard #
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Biotechnology.		
	02.01 Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
	02.02 Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03 Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	

Florida Standards			Correlation to CTE Program Standard #
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Biotechnology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		
03.06	Attend to precision. MAFS.K12.MP.6.1		
03.07	Look for and make use of structure. MAFS.K12.MP.7.1		
03.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
Academic Knowledge Standards:			
These standards support the following Florida Standards and Next Generation	MAFS.912.S-IC.2	SC.912.L.14.1, 2, 3 SC.912.L.16.3,5,8,9,	

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
Sunshine State Standards:		10,11,14,16,17 SC.912.L.17.14 SC.912.L.18.1,11 SC.912.N.1.1,2,3,4,5, 6, 7 SC.912.N.2.1, 2, 5 SC.912.N.3.4, 3.5 SC.912.N.4.1, 2 SC.912.P.8.6, 7	
04.0 Apply knowledge of the nature of science and scientific habits of mind to solve problems, and employ safe and effective use of laboratory technologies--The student will be able to:			
04.01 Know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.			
04.02 Know that from time to time, major shifts occur in the scientific view of how the world works, but that more often, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.			
04.03 Understand that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.			
04.04 Know that the potential for bias exists within individuals and scientific teams, and therefore scientists are expected to seek out possible sources of bias in the design of their investigations and in their data analysis.			
04.05 Understand that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.			
04.06 Understand that in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
04.07	Know that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex but that scientists operate on the belief that the rules can be discovered by careful, systemic study.			
04.08	Understand the difference between laws and theories.			
05.0	Demonstrate understanding of the roles of matter, energy, in the chemical processes of cells, organisms--The student will be able to:			
05.01	Knows that the electron configuration in atoms determines how a substance reacts and how much energy is involved in its reactions.			
05.02	Knows that the vast diversity of the properties of materials is primarily due to variations in the forces that hold molecules together.			
05.03	Knows that a change from one phase of matter to another involves a gain or loss of energy.			
05.04	Knows that connections (bonds) form between substances when outer-shell electrons are either transferred or shared between their atoms, changing the properties of substances.			
05.05	Knows that the number and configuration of electrons will equal the number of protons in an electrically neutral atom and when an atom gains or loses electrons the charge is unbalanced.			
05.06	Knows the difference between an element, a molecule, ion, and a compound			
05.07	Knows that elements are arranged into groups and families based on similarities in electron structure and that their physical and chemical properties can be predicted.			
05.08	Understand how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).			
05.09	Understand that there is conservation of mass and energy when matter is transformed.			
05.10	Understand that biological systems obey the same laws of conservation as physical systems.			
05.11	Knows that organisms respond to internal and external stimuli.			
06.0	Demonstrate an understanding of the structure and processes of the cell, with emphasis on reproduction and communication--The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
06.01	Knows that body structures are uniquely designed and adapted for their function.			
06.02	Knows that cell behavior can be affected by molecules from other parts of the organism or even from other organisms, and the environment.			
07.0	Demonstrate an understanding of the fundamentals of biochemistry including protein synthesis and reproduction--The student will be able to:			
07.01	Know that body processes involve specific biochemical reactions governed by biochemical principles, and that pathways have been identified through advances in molecular analyses, which have led to better understanding, diagnosis, and treatment of disease.			
07.02	Know that membranes are sites for chemical synthesis and essential energy conversions.			
07.03	Know the complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins.			
08.0	Demonstrate an understanding of genetics, including the principles of, molecular basis, diversity, and applications to biotechnology--The student will be able to:			
08.01	Understands the mechanism of asexual and sexual reproduction and knows the different genetic advantages and disadvantages of sexual and asexual reproduction.			
08.02	Knows that every cell contains a “blueprint” coded in DNA molecules that specify how proteins are assembled to regulate cells.			
09.0	Demonstrate an understanding of the levels of organization, from atoms to molecular DNA to organisms, classification, taxonomy--The student will be able to:			
09.01	Knows that chemical elements that make up the molecules of living things are combined and recombined in different ways.			
10.0	Demonstrate an understanding of the interdependence of organisms, humans, and the environment--The student will be able to:			
10.01	Understands the interconnectedness of the systems on Earth and the quality of life.			
10.02	Knows of the great diversity and interdependence of living things.			
10.03	Know that changes in a component of an ecosystem will have unpredictable and predictable effects on the entire system, but			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	that the components of the system tend to react in a way that will restore the ecosystem to its original condition.			
11.0	Demonstrate an understanding of genetic diversity, selection, adaptations, and changes through time--The student will be able to:			
11.01	Understand the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity.			
11.02	Know of the great diversity and interdependence of living things.			
11.03	Understands how genetic variation of offspring contributes to natural selection.			
12.0	Demonstrate an understanding of the legal and ethical responsibilities associated with working with biological specimens for research or industry, bioethics--The student will be able to:			
12.01	Understand the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.			
12.02	Know that scientists first define then control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural occurrences to discern patterns.			
12.03	Know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.			
12.04	Know that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.			
12.05	Discuss the extended impact of involving animal and human subjects in research with respect to humane treatment, providing full disclosure to clinical trial participants, ensuring patient confidentiality, and obtaining familial consent.			
13.0	Demonstrate an understanding of the connection between biotechnology, agricultural, food, and medical technologies and careers--The student will be able to:			
13.01	Know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
13.02 Know that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.			
CTE Performance Standards:			
14.0 Demonstrate knowledge of the history, career fields, and benefits of biotechnology--The student will be able to:		SC.912.N.4.2	
14.01 Describe major historic developments in biotechnology fields such as pharmaceuticals, biopharmaceuticals, agriculture, diagnostics, industrial products, devices, instrumentation, and research and development.			
14.02 Identify several products obtained through recombinant DNA technology and other biotechnology advances.			
14.03 Describe the major steps in a product's move through a company's product pipeline.			
14.04 Explain how companies decide on the research and development targets and potential products.			
14.05 Give examples of how the biotechnology revolution has had an impact on current science and manufacturing practices, as well as how new discoveries in science have in turn impacted biotechnology.			
14.06 Illustrate examples of how biotechnology has led to benefits and risks to society and how biotechnical advances affect human lives on a personal level.			
15.0 Recognize and practice safety procedures--The student will be able to:			
15.01 Identify safety symbols and signs.			
15.02 Identify appropriate safety procedures and guidelines.			
15.03 Demonstrate an understanding of the emergency procedures in case of fire, burn, chemical spill or other hazardous situations.			
15.04 Recognize laboratory safety hazards and avoid them.			
15.05 Locate and identify emergency equipment, including first aid.			
15.06 Use laboratory apparatus, materials, and technology in an appropriate and safe manner.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
15.07	Locate a Material Safety Data Sheet (MSDS) and use the information to operate in a safe manner.			
15.08	Demonstrate knowledge of universal precautions for blood-borne pathogens.			
16.0	Recognize and follows quality control procedures and regulatory guidelines--The student will be able to:			
16.01	Identify the need for and function of regulatory agencies such as those in government, industry, and society.			
16.02	Describe appropriate attire for different biotechnology workplaces including the office, laboratory and cleanroom environments.			
16.03	Monitor, use, store and dispose of hazardous materials properly.			
16.04	Clean, organize, and sterilize materials and equipment.			
17.0	Demonstrate the ability to communicate and use interpersonal skills effectively--The student will be able to:			
17.01	Follow all oral and written instructions.			
17.02	Demonstrate good listening, writing, and verbal communication skills and procedures.			
17.03	Appropriately use and respond to verbal and non-verbal cues.			
17.04	Use correct spelling, grammar, and format in all written communication.			
17.05	Use appropriate scientific terminology and abbreviations.			
17.06	Recognize the importance of courtesy and respect and maintain good interpersonal relationships.			
17.07	Read and discuss technical material.			
17.08	Read and present a scientific paper for discussion, including an overview of the objective, experimental methods, results, and conclusions.			
18.0	Apply basic skills in scientific inquiry, calculations, and analysis--The student will be able to:	MAFS.912.S-IC.2	SC.912.N.1.1; 2	
18.01	Demonstrate knowledge of the scientific method.			
18.02	Use a variety of methods including literature searches in libraries, computer databases, or on-line, for gathering background information, making observations, and collecting and organizing			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	data.			
18.03	Use the scientific method to conduct a valid experiment, including hypothesis formation, data collection, data analysis including results and discussion, and conclusion.			
18.04	Maintain a scientific notebook that includes all laboratory procedures, data, and conclusions.			
18.05	Properly and safely operate scientific equipment including graduates, hoods, microscopes, pipets, micropipets, electronic balance, pH meters, incubators, centrifuges, water baths, power supplies and electrophoresis chambers.			
18.06	Make and use measurements in both traditional and metric units.			
18.07	Measure time, temperature, distance, capacity and mass/weight.			
18.08	Describe the relationship between 12 and 24 hour time and be able to convert between the two.			
18.09	Make estimates and approximations in order to test the reasonableness of the result.			
18.10	Evaluate the validity of results obtained during experimentation and product development.			
18.11	Interpret and use graphs, charts and tables used to collect and analyze data.			
18.12	Interpret quantitative and qualitative data.			
18.13	Demonstrate ability to evaluate and draw conclusions.			
18.14	Follow guidelines to prepare a scientific report.			
19.0	Demonstrate knowledge of organism structure and function--The student will be able to:		SC.912.L.14.1,2,3,9 SC.912.L.15.6, 15 SC.912.L.16.1,2,3,4, 5,6,7,9,14,15,16,17 SC.912.L.18.1, 7,8, 9	
19.01	Recognize and distinguish between the following based upon the hierarchy of organization of organisms: atom, molecule, cells, tissue, organs, organ system, and organism.			
19.02	Outline the life cycle and characteristics of certain model organisms used in the biotechnology industry, including bacterial, yeast, and mammalian cells, and viruses.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
19.03	Differentiate between prokaryotic and eukaryotic cells.			
19.04	Describe the cell (both prokaryotes and eukaryotes) as the basic unit of life.			
19.05	Analyze the difference between plant and animal cells.			
19.06	Describe cell structure and function.			
19.07	Differentiate between mitosis and meiosis.			
19.08	Describe the role of DNA, RNA, and ribosomes in protein synthesis.			
20.0	Utilize materials processing and standard laboratory operating procedures for biotechnology--The student will be able to:		SC.912.L.14.6 SC.912.N.1.1	
20.01	Maintain a clean and organized work area.			
20.02	Follow written protocols and oral directions to perform a variety of laboratory and technical tasks.			
20.03	Determine appropriate equipment and units of measurement for a given task.			
20.04	Discuss and perform disinfection and sterilization techniques.			
21.0	Apply biotechnical materials analysis skills--The student will be able to:		SC.912.L.14.3 SC.912.L.16.11,12 SC.912.L.17.13, 20	
21.01	Isolate DNA from a variety of cells.			
21.02	Explain the principles involved in agarose gel electrophoresis.			
21.03	Prepare, load, run, visualize, and analyze DNA samples on an agarose gel.			
21.04	Describe the meaning in differences in DNA and peptide bands seen on agarose gels.			
21.05	Explain the difference between analyzing PCR products on conventional gels vs. using a Realtime PCR system.			
21.06	Discuss sources of environmental contamination and methods of detection in controlled environments.			
22.0	Demonstrates knowledge of basic chemistry as applied to biotechnology procedures--The student will be able to:		SC.912.N.3.5 SC.912.P.8.4,5,6,7,8,9 SC.912.P.12.12	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
22.01	Recognize and provide labels for models of neutral atoms, ions, and isotopes.			
22.02	Differentiate between atoms, elements, molecules, compounds, mixtures and solutions.			
22.03	Compare and contrast homogenous and heterogeneous solutions and suspensions.			
22.04	Determine chemical characteristics and reactivity based on electron configuration.			
22.05	Demonstrate that the rate of chemical reactions depend on reactant concentration or temperature, or the presence of a catalyst.			
22.06	Explain how the electron configuration determines covalent and ionic bonds.			
22.07	Compare and contrast the variety of forces that hold matter together.			
23.0	Utilizes basic knowledge of microbiology and blood-borne diseases, including AIDS--The student will be able to:		SC.912.L14.3, 6 SC.912.L.15.5, 6	
23.01	Differentiate between aerobic vs. anaerobic bacteria, viruses, bacteriophage, and mycoplasma.			
23.02	Discuss microbial taxonomy and classification.			
23.03	Practice aseptic techniques as required.			
23.04	Discuss sterilization and isolation techniques.			
23.05	Discuss techniques of inoculation and transfer of cultures.			
23.06	Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace.			
23.07	Identify "at risk" behaviors which promote the spread of diseases caused by blood borne pathogens.			
23.08	Discuss differences between sterilization, decontamination, and disinfection.			
23.09	Demonstrate proper protocol for the disposal of biohazardous waste and microorganisms.			
24.0	Demonstrate knowledge of legal and ethical responsibilities--The student will be able to:		SC.912.L.16.10	
24.01	Discuss ethical, legal and social issues raised by biotechnology.			
25.0	Demonstrate literacy and computer skills applicable to the biotechnology industry--The student will be able to:	MAFS.912.S-IC.2		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
25.01	Define terms and demonstrate basic computer skills.			
25.02	Describe the uses of computers in the biotechnology industry.			
25.03	Use the Internet to gather and share scientific and regulatory information.			
25.04	Use spreadsheet software to calculate and analyze data.			
26.0	Demonstrate employability skills--The student will be able to:			
26.01	Demonstrate appropriate responses to criticism and coaching from employer, supervisor, or other persons.			
26.02	Demonstrate appropriate methods for asking questions, and providing constructive criticism and feedback.			
26.03	Use several resources including the internet to gather information about job opportunities in the biotechnology field.			
26.04	Outline the opportunities for careers in biotechnology in health, industry, medicine, genetics, agriculture, etc.			
26.05	Identify and demonstrate acceptable work habits and health habits.			
26.06	Follow acceptable work habits, personal characteristics and hygiene habits for the biotechnology workplace.			

Florida Department of Education
Student Performance Standards

Course Title: **Biotechnology 2**
Course Number: **3027020**
Course Credit: **1 Science**

Course Description:

This course provides exploratory experience combining laboratory and real-life applications in the field of biotechnology. The content includes, but is not limited to, the following:

- The nature of science
- Chemical processes in biotechnology, pH, solutions, molarity
- Cell propagation, growth and cultures for biotechnology
- Biochemistry, proteins, enzymes, plasmids, recombinants, blood borne pathogens
- Genetics and biotechnology, gene selection, transformation, analysis
- Structure and function of various organisms used as genetic models
- Interdependence of organisms, humans, and the environment,
- Genetic diversity and selection
- Connection between biotechnology, agricultural, food, and medicine and careers
- Bioethics

This course shall integrate the Goal 3 Student Performance Standards of the Florida System of School Improvement and Accountability as appropriate to the content and processes of the subject matter.

Prerequisite of this course is Biotechnology in addition to the co-requisite or prerequisite of Biology 1, Honors Biology, or Biology Technology.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Biotechnology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	

Florida Standards		Correlation to CTE Program Standard #
01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure	
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	
01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas	
01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity	
01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades	

Florida Standards			Correlation to CTE Program Standard #
		9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Biotechnology.		
	02.01	Text Types and Purposes	
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	
	02.02	Production and Distribution of Writing	
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
	02.03	Research to Build and Present Knowledge	
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	

Florida Standards			Correlation to CTE Program Standard #
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Biotechnology.		
03.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
03.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		
03.03	Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1		
03.04	Model with mathematics. MAFS.K12.MP.4.1		
03.05	Use appropriate tools strategically. MAFS.K12.MP.5.1		
03.06	Attend to precision. MAFS.K12.MP.6.1		
03.07	Look for and make use of structure. MAFS.K12.MP.7.1		
03.08	Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1		

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
Academic Knowledge Standards:				
27.0	Apply knowledge of the nature of science and scientific habits of mind to solve problems, and employ safe and effective use of laboratory technologies--The student will be able to:			
27.01	Know that investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.			
27.02	Know that from time to time, major shifts occur in the scientific view of how the world works, but that more often, the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.			
27.03	Understand that no matter how well one theory fits observations, a new theory might fit them as well or better, or might fit a wider range of observations, because in science, the testing, revising, and occasional discarding of theories, new and old, never ends and leads to an increasingly better understanding of how things work in the world, but not to absolute truth.			
27.04	Know that the potential for bias exists within individuals and scientific teams, and therefore scientists are expected to seek out possible sources of bias in the design of their investigations and in their data analysis.			
27.05	Understand that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.			
27.06	Understand that in the short run, new ideas that do not mesh well with mainstream ideas in science often encounter vigorous criticism and that in the long run, theories are judged by how they fit with other theories, the range of observations they explain, how well they explain observations, and how effective they are in predicting new findings.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
27.07	Know that scientists assume that the universe is a vast system in which basic rules exist that may range from very simple to extremely complex but that scientists operate on the belief that the rules can be discovered by careful, systemic study.			
28.0	Demonstrate understanding of the chemical processes in biotechnology, pH, solutions, dilutions, molarity--The student will be able to:			
28.01	Experiments and determines that the rates of reaction among atoms and molecules depend on the concentration, pressure, and temperature of the reactants and the presence of absence of catalysts.			
28.02	Understand how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth).			
28.03	Understand that there is conservation of mass and energy when matter is transformed.			
28.04	Knows that membranes are sites for chemical synthesis and essential energy conversions.			
28.05	Understands that biological systems obey the same laws of conservation as physical systems.			
29.0	Demonstrate an understanding of cell propagation, growth and cultures for biotechnology--The student will be able to:			
29.01	Understand the mechanisms of asexual and sexual reproduction and know the different genetic advantages and disadvantages of asexual and sexual reproduction.			
30.0	Demonstrate an understanding of the fundamentals of biochemistry including protein synthesis, recombinants, and reproduction, analysis, western blot--The student will be able to:			
30.01	Define monoclonal antibodies and hybridoma technology.			
30.02	Know the complex interactions among the different kinds of molecules in the cell cause distinct cycles of activity governed by proteins.			
30.03	Know that cell behavior can be affected by molecules from other parts of the organism or even from other organisms.			
31.0	Demonstrate an understanding of genetics and biotechnology, gene selection, transformation, analysis, PCR, northern and southern blot--The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
31.01	Know that the chemical elements that make up the molecules of living things are combined and recombined in different ways.			
31.02	Knows that every cell contains a “blueprint” coded in DNA molecules that specify how proteins are assembled to regulate cells.			
32.0	Demonstrate a knowledge of the structure and function and reproduction of various organisms used as genetic models--The student will be able to:			
32.01	Know that body structures are uniquely designed and adapted for their function.			
32.02	Describe animal models used in research, and the types of studies they are optimally used for.			
33.0	Demonstrate an understanding of the interdependence of organisms, humans, and the environment--The student will be able to:			
33.01	Understands the interconnectedness of the systems on Earth and the quality of life.			
33.02	Know that changes in a component of an ecosystem will have unpredictable effects on the entire system, but that the components of the system tend to react in a way that will restore the ecosystem to its original condition.			
34.0	Demonstrate an understanding of genetic diversity, natural and genetic selection--The student will be able to:			
34.01	Understand the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity.			
34.02	Know of the great diversity and interdependence of living things, and the value of biodiversity.			
34.03	Understands how genetic variation of offspring contributes to natural selection.			
35.0	Demonstrate an understanding of bioethics--The student will be able to:			
35.01	Understand the importance of a sense of responsibility, a commitment to peer review, truthful reporting of the methods and outcomes of investigations, and making the public aware of the findings.			
35.02	Know that scientists first define then control conditions in order to obtain evidence, but when that is not possible for practical or ethical reasons, they try to observe a wide range of natural			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	occurrences to discern patterns.			
35.03	Know that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure.			
35.04	Know that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.			
36.0	Demonstrate and understanding of the connection between Biotechnology, agricultural, food, and medical technologies and careers--The student will be able to:			
36.01	Know that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.			
36.02	Know that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.			
36.03	Discuss how scientists contribute to and promote science-based policy in US government.			
36.04	Discuss the correlation between scientific discovery and product development, based on societal benefit vs. financial benefit to a company.			
CTE Performance Standards:				
37.0	Demonstrate knowledge of the history, career fields, and benefits of biotechnology--The student will be able to:		SC.912.E.6.6 SC.912.L.16.10 SC.912.L.17.11 SC.912.N.2.5	
37.01	Understand that technologies used in biotechnology continue to be developed and improved, with respect to advances in discoveries, applications, and demand for increased efficiency.			
37.02	Compare the developments in two biotechnology fields and make predictions for future developments in those areas.			
37.03	Identify several local biotechnology companies specializing in the production of pharmaceuticals, agricultural products, industrial products, and research instruments and reagents.			
37.04	Compare the benefits of products derived from biotechnological advances (including DNA technology), to an environment devoid			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	of biotechnological products or applications.			
37.05	Demonstrate knowledge of various career fields in the biotechnology industry, including but not limited to research and development, pre-clinical and clinical trials, manufacturing, facilities and equipment, quality control, quality assurance, regulatory affairs, marketing, and sales.			
38.0	Recognize and practice safety procedures--The student will be able to:		SC.912.L.14.6 SC.912.N.1.1	
38.01	Define Biological Safety Levels 1 through 4 and their differences.			
38.02	Describe appropriate attire for Biological Safety Levels 1 through 4.			
38.03	Identify potential biohazards and relate how to deal with a variety of biohazards.			
38.04	Use appropriate safety procedures and guidelines and demonstrate knowledge of emergency procedures.			
38.05	Maintain equipment and material logs for all apparatus, materials, and technology.			
38.06	Maintain Material Safety Data Sheet (MSDS) notebook and appropriately reference for each activity.			
38.07	Follow approved protocols for all activities which may cause exposure to blood-borne pathogens.			
38.08	Describe strategies used in a cleanroom to minimize the introduction of contaminating microorganisms or particulates.			
39.0	Recognize and follows quality control procedures and regulatory guidelines--The student will be able to:		SC.912.L.17.13, 14	
39.01	Describe the need for and function of regulatory agencies such as those in government, industry, and society.			
39.02	Discuss quality control and assurance with respect to documentation.			
39.03	Discuss quality control in relation to inspection results and specifications, procedures, testing methods, process control, regulatory specifications and documentation, and internal audits.			
39.04	Utilize quality control methods in relation to hazardous and non-hazardous materials.			
40.0	Demonstrate the ability to communicate and use interpersonal skills effectively--The student will be able to:		SC.912.N.1.1	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
40.01	Demonstrate ability to give and follow oral and written directions.			
40.02	Recognize potential errors in protocol and address them with colleagues and the appropriate supervisor.			
40.03	Maintain thorough documentation of tasks and procedures.			
40.04	Work effectively in a research, manufacturing, quality control, or quality assurance team with a defined responsibility.			
40.05	Incorporate appropriate scientific terminology and abbreviations into all technical documents.			
40.06	Prepare, analyze, and discuss technical material.			
41.0	Apply basic skills in scientific inquiry, calculations, and analysis--The student will be able to:	MAFS.912.S-IC.2	SC.912.N.1.1, 3, 4	
41.01	Develop scientific questions, hypotheses, and experimental plans.			
41.02	Properly and safely operate scientific equipment including mixers, analytical balances, stirrers, shakers, conductivity meters, and a hemocytometer.			
41.03	Calculate ratios used for making chemical dilutions or plate counting.			
41.04	Compose a thorough concluding statement outlining the results of an experiment with evidence, explanations, error analysis, and practical applications.			
41.05	Evaluate scientific reports with well-supported, clearly presented opinions.			
41.06	Consistently analyze and properly uses a variety of valid literature resources.			
41.07	Set-up and maintain a legal scientific notebook that includes an account of all laboratory procedures, data, conclusions, and appropriate signatures.			
41.08	Measure time, temperature, distance, capacity, mass/weight, flow rates and growth rates.			
41.09	Use 24 hour time in all documents.			
41.10	Create graphs, charts and tables used to record, analyze, and convey scientific data.			
41.11	Critically analyze quantitative and qualitative data.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
41.12	Organize and communicate clear, concise written and oral reports of scientific findings.			
42.0	Demonstrate knowledge of organism structure and function--The student will be able to:		SC.912.L.15.15 SC.912.L.16.19 SC.912.L.18.1, 4 SC.912.N.1.1	
42.01	Discuss the makeup of chromosomes.			
42.02	Discuss the process of nucleic acid transfer.			
42.03	Describe the relationship of cellular science and biotechnology.			
42.04	Describe how enzymes regulate all aspects of protein synthesis.			
42.05	Explain how the structure of nucleic acid affects its isolation from cells and solutions.			
42.06	Describe how cells are engineered to express recombinant proteins.			
42.07	Identify groups of proteins based on their functions, citing specific examples of proteins in each group.			
42.08	Use the Internet to find information about the structure and function of specific proteins.			
43.0	Utilize materials processing and standard laboratory operating procedures for biotechnology--The student will be able to:	MAFS.912.S-IC.2	SC.912.L.14.3, 6 SC.912.N.1.1	
43.01	Maintain a professional laboratory space following standard operating procedures.			
43.02	Perform a variety of biological tests and chemical assays, collect data, perform calculations and statistical analysis.			
43.03	Discuss classification, composition and preparation of culture media.			
43.04	Discuss collection and handling of specimens for fungal, bacterial, mammalian cells and viral specimens, and parasites.			
43.05	Prepare and examine specimens, and identify ova and parasites as indicated.			
44.0	Apply biotechnical materials analysis skills--The student will be able to:		SC.912.L.14.3 SC.912.L.15.15 SC.912.L.16.3, 5, 9, 11, 12, 14 SC.912.L.17.13 SC.912.N.1.1 SC.912.P.8.11	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
44.01	Isolate DNA from cells and analyze its purity and concentration.			
44.02	Outline the steps in production, product testing, and delivery of a product made through recombinant DNA technology.			
44.03	Explain the principles involved in polyacrylamide and agarose gel electrophoresis.			
44.04	Prepare, load, run, visualize, and analyze protein samples on a polyacrylamide or agarose gel.			
44.05	Prepare protein solutions and dilutions at specific concentrations and pH.			
44.06	Use protein indicator solutions to identify the presence and concentration of protein in solution.			
44.07	Describe the meaning in differences in DNA and peptide bands seen on polyacrylamide or agarose gels.			
44.08	Prepare and maintain plate and broth cultures of bacteria. Explain how polyacrilymide gel electrophoresis (PAGE) is used with column chromatography to monitor protein product.			
44.09	Describe the steps in harvesting protein product from fermentation cell culture.			
44.10	Outline the steps of using a visible light spectrophotometer.			
44.11	Prepare a serial dilution of protein and measure absorbance at a given wavelength.			
44.12	Use a standard curve to determine the concentration of an unknown protein solution.			
44.13	Explain the protocol and application for isolating plasmids.			
44.14	Explain the process and application of inserting genes that code for antibiotic resistance into a plasmid.			
44.15	Demonstrate the ability to culture, propagate, and harvest bacteria.			
44.16	Understand the bacterial growth stages in culture.			
44.17	Understand components of growth media such as energy source, and antibiotics, and incubation parameters: time, temp, atmospheric concentration.			
44.18	Explain the process of utilizing restriction enzymes and DNA ligase to insert a new gene into a plasmid.			
44.19	Explain the process of replicating plasmids.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	44.20 Practice environmental monitoring using agar plates.			
45.0	Demonstrates knowledge of basic chemistry as applied to biotechnology procedures--The student will be able to:		SC.912.P.8.4, 5, 7, 9, 11	
	45.01 Use the periodic table to predict valence electron configuration, and physical and chemical characteristics of elements.			
	45.02 Use the periodic table to calculate molarity.			
	45.03 Balance equations to show that there is a conservation of matter. Explain hydrogen and polar bonding.			
	45.04 Discuss and use techniques that identify and separate components of a homogenous mixture.			
	45.05 Explain and use the function of pH in the preservation, purification, and functioning of proteins.			
	45.06 Use pH paper or pH meter to measure and adjust pH.			
	45.07 Calculate how to prepare solutions based on % mass/volume.			
	45.08 Calculate how to prepare solutions based on molar concentrations.			
	45.09 Use stoichiometry and molarity to prepare solutions of any volume and concentration.			
	45.10 Prepare dilutions of concentrated solutions.			
46.0	Utilizes basic knowledge of microbiology and blood-borne diseases, including AIDS--The student will be able to:		SC.912.L.14.3, 4, 6, 16, 52 SC.912.L.15.5, 6 SC.912.L.16.9, 10 SC.912.L.17.1,2,4,5	
	46.01 Discuss bacterial metabolism, reproduction, cell structures and their functions.			
	46.02 Perform microbiology techniques in controlled environments.			
	46.03 Demonstrate techniques of microscope use related to oil immersion and slide preparation.			
	46.04 Discuss uses for different microscopy methods, including light, fluorescent, phase-contrast, and electron.			
	46.05 Demonstrate the preparation and interpretation of Gram stains.			
	46.06 Perform various preparation and staining techniques.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
46.07	Perform disinfection and aseptic techniques.			
46.08	Perform sterilization and isolation techniques.			
46.09	Prepare artificial culture media.			
46.10	Perform techniques of inoculation and transfer of cultures.			
46.11	Use various methods to monitor the growth of cell cultures.			
46.12	Discuss the immune system and the normal immune response.			
46.13	Perform antigen and antibody testing.			
46.14	Discuss methods that utilize the antigen/antibody complex as tools for research, diagnosis, and testing.			
46.15	Discuss the ABO, Rh and other blood group systems.			
46.16	Distinguish between fact and fallacy about the transmission and treatment of diseases caused by blood borne pathogens including Hepatitis B.			
46.17	Identify community resources and services available to the individuals with diseases caused by blood borne pathogens.			
46.18	Demonstrate knowledge of the legal aspects of AIDS, including testing.			
46.19	Describe how blood-borne pathogens are avoided in manufacturing.			
47.0	Demonstrate knowledge of legal and ethical responsibilities--The student will be able to:		SC.912.L.16.10 SC.912.L.17.18	
47.01	Recognize ethical issues of the biotechnology workplace such as employee privacy, employee safety, animal testing, etc.			
47.02	List the local, regional, state and federal agencies who oversee safety, ethics, and manufacturing.			
47.03	Provide examples of the appropriate professional traits of a worker in biotechnology.			
47.04	Outline the proper protocol for reporting unsafe or unethical behavior.			
48.0	Demonstrate literacy and computer skills applicable to the biotechnology industry--The student will be able to:	MAFS.912.S-IC.2		
48.01	Use the Internet to gather and share scientific and regulatory information.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
48.02	Use a variety of methods including literature searches in libraries, in computer databases, and on-line for gathering background information, making observations, and collecting and organizing data.			
48.03	Use a computer spreadsheet, word processing, and presentation programs to collect, analyze and report information or data.			
49.0	Demonstrate employability skills--The student will be able to:			
49.01	Conduct a job search.			
49.02	Develop a portfolio that demonstrates proficiency in specific biotechnology workplace tasks including writing samples and performance-based lab and computer skills.			
49.03	Describe the opportunities for careers in biotechnology in health, industry, medicine, genetics, agriculture, etc.			
49.04	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.			
49.05	Analyze the impact that work and health habits play in the biotechnology industry.			
49.06	Recognize appropriate professional behavior.			
49.07	Explain the roles of different departments and the employees within each department at an industry site.			
49.08	Describe the departmental functions in a typical biotechnology company.			

Florida Department of Education
Student Performance Standards

Course Title: **Biotechnology 3**
Course Number: **8736030**
Course Credit: **1**

Biotechnology 3 is a course designed to provide students with intense laboratory and research skills in preparation for continued education and/or entry into the biotechnology industry. Students will build upon the skills attained in Biotechnology 1 and Biotechnology 2 as they design and conduct experiments relevant to current biotechnology. A close association with local industry and postsecondary institutions will provide additional opportunities for development and application of biotechnology practices.

Florida Standards			Correlation to CTE Program Standard #
50.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Industrial Biotechnology.		
	50.01 Key Ideas and Details		
	50.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	50.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	50.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	50.02 Craft and Structure		
	50.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	50.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	50.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
50.03	Integration of Knowledge and Ideas		
	50.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	50.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	50.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
50.04	Range of Reading and Level of Text Complexity		
	50.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	50.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
51.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Industrial Biotechnology.		
51.01	Text Types and Purposes		
	51.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	51.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	51.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
51.02	Production and Distribution of Writing		
	51.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	51.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	51.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
51.03	Research to Build and Present Knowledge		
	51.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	51.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	51.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
51.04	Range of Writing		
	51.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
52.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Industrial Biotechnology.		

Florida Standards	Correlation to CTE Program Standard #
52.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
52.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
52.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
52.04 Model with mathematics. MAFS.K12.MP.4.1	
52.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
52.06 Attend to precision. MAFS.K12.MP.6.1	
52.07 Look for and make use of structure. MAFS.K12.MP.7.1	
52.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

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Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
CTE Performance Standards:			
53.0 History, career fields, and benefits of biotechnology--The student will be able to:		SC.912.L.17.15 SC.912.N.1.1, 4, 5 SC.912.N.2.2, 5	
53.01 Identify a recent advancement in a biotechnological tool or method, and compare it to its predecessor.			
53.02 Select and evaluate the potential of a product based on industry criteria.			
53.03 Explain how biotechnology practices, procedures, and philosophies have evolved to current high technology and integrated disciplines.			
53.04 Illustrate examples of how biotechnology has led to benefits and risks to society and how biotechnical advances affect human			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	lives on a personal level.			
53.05	Graph a history timeline with medical advances due to technology advances.			
53.06	Research and analyze career opportunities available in biotechnology and select the career pathway best suited to your interests, abilities, and objectives.			
53.07	Discuss medical, agricultural, forensic, and environmental applications of biotechnology.			
54.0	Safety procedures--The student will be able to:		SC.912.L.14.6 SC.912.L.16.10 SC.912.L.17.16, 20 SC.912.N.1.1, 2 SC.912.N.4.2	
54.01	Identify safety symbols and signs.			
54.02	Use appropriate safety procedures and guidelines.			
54.03	Demonstrate an understanding of the emergency procedures in case of fire, burn, chemical spill or other hazardous situations.			
54.04	Recognize laboratory safety hazards and avoid them.			
54.05	Locate and be able to use emergency equipment, including first aid.			
54.06	Identify potential biohazards and relate how to deal with a variety of biohazards.			
54.07	Use laboratory apparatus, materials, and technology in an appropriate and safe manner.			
54.08	Locate a Material Safety Data Sheet (MSDS) and use the information to operate in a safe manner.			
54.09	Follow universal precautions for blood-borne pathogens.			
55.0	Quality control procedures and regulatory guidelines--The student will be able to:	MAFS.912.S-IC.2	SC.912.L.17.13, 20 SC.912.N.1.1, 2 SC.912.N.2.2	
55.01	Evaluate the need for and function of regulatory agencies such as those in government, industry, and society.			
55.02	Understand that all products intended to be used for the diagnosis, cure, mitigation, treatment, or prevention of disease, must go through a regulatory approval process that is based on documented research and testing to ensure the product is safe			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	and efficacious (works).			
55.03	Describe the purpose of current Good Manufacturing Practices, and how they are supported by guidances from the International Organization for Standardization.			
55.04	Analyze experimental data and/or manufacturing processing documentation from the perspective of quality assurance.			
55.05	Discuss quality control in relation to inspection results and specifications, procedures, testing methods, process control, regulatory specifications and documentation, and internal audits.			
55.06	Monitor, use, store and dispose of hazardous materials properly.			
55.07	Check and maintain equipment and logs.			
55.08	Clean, organize, and sterilize materials.			
55.09	Manage material and supply inventories.			
55.10	Define/chart the process of receiving an unqualified (or qualified) raw material and follow it through the manufacturing process into the finished product.			
56.0	Communicate and use interpersonal skills effectively--The student will be able to:		SC.912.L.17.13 SC.912.N.1.1, 3, 7 SC.912.N.2.1, 2, 4, 5 SC.912.N.3.1	
56.01	Follow all oral and written instructions.			
56.02	Demonstrate ability to give oral and written directions.			
56.03	Demonstrate good listening, writing, and verbal communication skills and procedures.			
56.04	Recognize potential errors in protocol and address them with colleagues and the appropriate supervisor.			
56.05	Maintain thorough documentation of tasks and procedures.			
56.06	Work effectively in a research, manufacturing, quality control, or quality assurance team with a defined responsibility.			
56.07	Develop basic observational skills and related documentation strategies in written and oral form.			
56.08	Identify characteristics of successful and unsuccessful communication.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
56.09	Appropriately use and respond to verbal and non-verbal cues.			
56.10	Use correct spelling, grammar, and format in all written communication.			
56.11	Use appropriate scientific terminology and abbreviations.			
56.12	Recognize the importance of courtesy and respect and maintain good interpersonal relationships.			
56.13	Interpret technical material and prepare a journal article related to the development of a process or product on which the student has worked.			
57.0	Basic skills in scientific inquiry, calculations, and analysis--The student will be able to:	MAFS.912.S-IC.2	SC.912.L.14.4 SC.912.N.1.1, 2, 3, 4, 5, 6, 7 SC.912.N.2.1, 2 SC.912.N.3.1, 4, 5 SC.912.N.4.1, 2	
57.01	Demonstrate knowledge of the scientific method in general and biotechnology research in manufacturing and quality control.			
57.02	Understand the applicability of Koch's postulates.			
57.03	Consistently analyze and properly uses valid literature resources.			
57.04	Set-up and maintain a legal scientific notebook that includes an account of all laboratory procedures, data, conclusions, and appropriate signatures.			
57.05	Properly and safely operate scientific equipment including graduates, hoods, microscopes, pipets, micropipets, electronic balance, pH meters, incubators, centrifuges, water baths, power supplies and electrophoresis chambers.			
57.06	Properly and safely operate scientific equipment including mixers, analytical balances, stirrers, shakers, conductivity meters, and a hemocytometer.			
57.07	Describe how to properly and safely use scientific equipment including spectrophotometer, autoclave, thermocycler, plate reader/fluorometer, and sterile hood/ biosafety cabinet.			
57.08	Understand why sometimes equipment is dedicated to one specific room, assay, or process.			
57.09	Describe how to properly and safely use scientific equipment including polarimeter, chart recorder, particle counter, and			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	hybridization oven.			
57.10	Make and use measurements in both traditional and metric units.			
57.11	Calculate ratios used for making chemical dilutions or plate counting.			
57.12	Measure time, temperature, distance, capacity, mass/weight, flow rates and growth rates.			
57.13	Describe the relationship between 12 and 24 hour time and be able to convert between the two.			
57.14	Make estimates and approximations in order to test the reasonableness of the result.			
57.15	Evaluate the validity of results obtained during experimentation and product development.			
57.16	Interpret and create graphs, charts and tables used to collect and analyze data.			
57.17	Interpret and critically analyze quantitative and qualitative data.			
57.18	Demonstrate ability to evaluate and draw conclusions.			
57.19	Organize and communicate clear, concise written and oral reports of scientific findings.			
57.20	Evaluate scientific reports with well-supported, clearly presented opinions. Monitor scientific equipment by conducting and documenting preventative maintenance and calibration.			
58.0	Organism structure and function--The student will be able to:		SC.912.L.14.2, 3 SC.912.L.16.3, 4, 5, 6, 7, 9, 10, 11, 12 SC.912.L.18.1, 4, 11	
58.01	Discuss the makeup of chromosomes.			
58.02	Discuss the process of nucleic acid transfer.			
58.03	Describe the relationship of cellular science and biotechnology.			
58.04	Explain how the structure of nucleic acid affects its isolation from cells and solutions.			
58.05	Describe how cells are engineered to express recombinant proteins.			
59.0	Materials processing and standard laboratory operating procedures for biotechnology--The student will be able to:	MAFS.912.S-IC.2 MAFS.912.S.5.3,8,9	SC.912.L.14.9 SC.912.L.15.4,5,6,7	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
			SC.912.L.18.1,2,3,4 SC.912.N.1.1	
59.01	Maintain a clean and organized work area.			
59.02	Follow written protocols and oral directions to perform a variety of laboratory and technical tasks.			
59.03	Determine appropriate equipment and units of measurement for a given task.			
59.04	Discuss the various sections of a Standard Operating Procedure (SOP), with respect to safety, equipment, reagents, procedural steps, result analysis, reporting, and troubleshooting.			
59.05	Perform a variety of biological tests and chemical assays, collect data, perform calculations and statistical analysis.			
59.06	Discuss and perform disinfection and sterilization techniques.			
59.07	Discuss classification, composition and preparation of culture media.			
59.08	Discuss collection and handling of specimens for fungal, bacterial, mammalian cells and viral specimens.			
59.09	Prepare and examine specimens, and identify ova and parasites as indicated.			
60.0	Biotechnical materials analysis skills--The student will be able to:		SC.912.L.14.2, 6, 9 SC.912.L.15.15 SC.912.L.16.2, 3, 5, 7, 10, 12 SC.912.L.17.13 SC.912.L.18.1, 4, 8, 11, 14 SC.912.N.1.1 SC.912.P.10.1, 10, 18, 19, 22 SC.912.P.12.12	
60.01	Outline the steps in cell culture, sterile technique, and media preparation.			
60.02	Describe the characteristics of proteins that allow for their purification after cloning transformed cells.			
60.03	Explain how polyacrilymide gel electrophoresis (PAGE) is used with column chromatography to monitor protein product.			
60.04	Describe the steps in harvesting protein product from fermentation cell culture.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
60.05	Summarize the steps in manufacturing and product testing and FDA approval for new drugs produced through genetic engineering.			
60.06	Outline the steps of using a visible light spectrophotometer.			
60.07	Prepare a serial dilution of protein and measure absorbance at a given wavelength.			
60.08	Use a standard curve to determine the concentration of an unknown protein solution.			
60.09	Do a linear regression to calculate protein concentration using a computer spreadsheet.			
60.10	Discuss techniques of chemistry related to standardization of procedure and use of standards, blanks and controls.			
60.11	Explain the protocol and application for isolating plasmids.			
60.12	Explain the process and application of inserting genes that code for antibiotic resistance into a plasmid.			
60.13	Demonstrate the ability to culture, propagate, and harvest bacteria.			
60.14	Explain the process of utilizing restriction enzymes and DNA ligase to insert a new gene into a plasmid.			
60.15	Explain the process of replicating plasmids.			
60.16	Practice environmental monitoring using agar plates.			
60.17	Discuss sources of environmental contamination and methods of detection in controlled environments.			
60.18	Demonstrate knowledge of and perform enzyme assays.			
61.0	Basic chemistry as applied to biotechnology procedures--The student will be able to:		SC.912.N.1.1 SC.912.P.8.2, 5, 6, 7, 8, 9, 11	
61.01	Use the periodic table to predict valence electron configuration, and physical and chemical characteristics of elements.			
61.02	Use the periodic table to calculate molarity.			
61.03	Balance equations to show that there is a conservation of matter.			
61.04	Explain hydrogen and polar bonding.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
61.05	Discuss and use techniques that identify and separate components of a homogenous mixture.			
61.06	Explain and use the function of pH in the preservation, purification, and functioning of proteins.			
61.07	Use pH paper or pH meter to measure and adjust pHSC.			
61.08	Calculate how to prepare solutions based on % mass/volume.			
61.09	Calculate how to prepare solutions based on molar concentrations.			
61.10	Use stoichiometry and molarity to prepare solutions of any volume and concentration.			
61.11	Prepare dilutions of concentrated solutions.			
62.0	Microbiology and blood-borne diseases, including AIDS--The student will be able to:		SC.912.L.14.1,2,3,6, 52 SC.912.L.15.5; SC.912.L.16.10,11, 12,13,14,15,16,17,18 SC.912.L.17.8 SC.912.N.1.1, 4, 6, 7	
62.01	Discuss microbial taxonomy and classification.			
62.02	Perform microbiology techniques in controlled environments.			
62.03	Perform disinfection techniques.			
62.04	Practice aseptic techniques as required.			
62.05	Perform sterilization techniques.			
62.06	Discuss isolation techniques.			
62.07	Prepare artificial culture media.			
62.08	Discuss techniques of inoculation and transfer of cultures			
62.09	Use various methods to monitor the growth of cell cultures.			
62.10	Describe conditions that promote cell growth under aseptic conditions in the laboratory and workplace.			
62.11	Discuss methods for the isolation, purification, and quantification of DNA and plasmid DNA.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
62.12 Perform antigen and antibody testing.			
62.13 Identify community resources and services available to the individuals with diseases caused by blood borne pathogens.			
62.14 Demonstrate knowledge of the legal aspects of AIDS, including testing.			
62.15 Describe how blood-borne pathogens are avoided in manufacturing.			
63.0 Legal and ethical responsibilities--The student will be able to:		SC.912.L.16.10 SC.912.N.1.2, 5, 6, 7 SC.912.N.2.3, 5	
63.01 Investigate an ethical, social, or legal issues facing biotechnology today and suggest an approach to solving it.			
63.02 Provide examples of the appropriate professional traits of a worker in biotechnology.			
63.03 Outline the proper protocol for reporting unsafe or unethical behavior.			
63.04 Describe a Code of Ethics consistent with the biotechnology industry			
63.05 Discuss the importance of maintaining confidentiality of information, including computer information.			
63.06 Recognize and report illegal and unethical practices of health care workers.			
64.0 Literacy and computer skills applicable to the biotechnology industry--The student will be able to:	MAFS.912.S-IC.2	SC.912.N.1.1, 4 SC.912.N.2.3, 4 SC.912.N.3.5	
64.01 Use the Internet to gather and share scientific and regulatory information.			
64.02 Use a computer spreadsheet, word processing, and presentation programs to collect, analyze and report information or data.			
64.03 Use a variety of methods including literature searches in libraries, in computer databases, and on-line for gathering background information, making observations, and collecting and organizing data.			
65.0 Employability skills--The student will be able to:		SC.912.L.16.10 SC.912.N.1.1, 4, 6, 7	
65.01 Conduct a job search.			
65.02 Use several resources including the Internet to gather information about job opportunities in the biotechnology field.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
65.03	Create an appropriate resume for use in applying for job opportunities in a biotechnology company.			
65.04	Use 'keywords' in a resume to match job description and rank higher when analyzed by resume scanning software.			
65.05	Complete a job application form correctly.			
65.06	Identify documents that may be required when applying for a job.			
65.07	Develop a portfolio that demonstrates proficiency in specific biotechnology workplace tasks including writing samples and performance-based lab and computer skills.			
65.08	Identify or demonstrate appropriate responses to criticism from employer, supervisor, or other persons.			
65.09	Evaluate the overall condition of personal work habits and health habits and the effect, (if any) these habits might have in the biotechnology workplace.			
65.10	Recognize appropriate professional behavior.			
65.11	Explain the roles of different departments and the employees within each department at an industry site.			
65.12	Describe the departmental functions in a typical biotechnology company.			
65.13	Demonstrate knowledge of how to make job changes appropriately.			

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

This program is designed to provide students with intense laboratory and research skills in preparation for continued education and/or entry into the biotechnology industry. Students will build upon the skills attained as they design and conduct experiments relevant to current biotechnology. A close association with local industry and postsecondary institutions will provide additional opportunities for development and application of biotechnology practices.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Courses in this program satisfying equally rigorous science content are:

- Biotechnology 1 (3027010)
- Biotechnology 2 (3027020)

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Assisting**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8743000
CIP Number	0647030301
Grade Level	9-12, 30, 31
Standard Length	6 credits
Teacher Certification	ENG 7G TEC CONSTR ¶7 ¶G BLDG CONST ¶7 ¶G MILLWRIGHT 7G IND ENGR 7G MACH SHOP @7 7G WELDING @7 7G ELECTRONIC @7 7G TEC ED 1 @ 2 (this certification applicable to Engineering Assisting 1 course only)
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9043 – Maintenance Workers, Machinery
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster.

The content includes but is not limited to safety and the proper use of tools and equipment, customer service, mathematics, blueprint reading, layout and metal fabrication, welding, electricity, two-stroke, four-stroke, and diesel engine repair, drive components, lubricants, employability skills, and entrepreneurship.

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 one occupational completion point.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8743010	Engineering Assisting 1	1 credit		2
	8743020	Engineering Assisting 2	1 credit		2
	8743030	Engineering Assisting 3	1 credit		2
	8743040	Engineering Assisting 4	1 credit		2
	8743050	Engineering Assisting 5	1 credit		2
A	8743060	Engineering Assisting 6	1 credit	49-9043	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Engineering Assisting 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Engineering Assisting 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Engineering Assisting 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Engineering Assisting 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Engineering Assisting 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Engineering Assisting 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Assisting.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Assisting.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.
04.0 Apply safety rules and procedures.
05.0 Use tools and equipment.
06.0 Demonstrate proficiency in applying customer service skills.
07.0 Perform mathematical calculations.
08.0 Demonstrate ability to read plans and drawings.
09.0 Perform measuring and layout operations.
10.0 Describe metals and their properties.
11.0 Operate metalworking machines.
12.0 Perform metal fabrication operations.
13.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Assisting.
14.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Assisting.
15.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.
16.0 Perform gas welding and cutting operations.
17.0 Perform electric metal-bonding operations.
18.0 Perform bench work skills.
19.0 Demonstrate knowledge of basic electricity and electronics.
20.0 Demonstrate proficiency in repairing and maintaining basic two-stroke cycle engines.
21.0 Demonstrate proficiency in repairing and maintaining basic four-stroke cycle engines.
22.0 Demonstrate proficiency in maintaining and repairing diesel engines.
23.0 Maintain drive components.
24.0 Maintain piping and tubing.
25.0 Troubleshoot hydraulic and pneumatic systems.
26.0 Handle and apply lubricants.

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 1**
Course Number: **8743010**
Course Credit: **1**

Note: TEC ED 1 @2 teacher certification applicable to Engineering Assisting 1 course only. **See "Teacher Certification" page 1**

Course Description:

This course includes instruction in basic skills as well as reading plans and performing measuring and layout operations.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Assisting.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Assisting.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Apply safety rules and procedures--The student will be able to:		
04.01 Practice shop safety rules and procedures.		
04.02 Practice personal safety rules and procedures.		
04.03 Practice fire safety rules and procedures.		
04.04 Practice electrical safety rules and procedures.		
04.05 Practice tool safety rules and procedures.		
04.06 Maintain a clean work and shop area.		
05.0 Use tools and equipment--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.01 Use general hand tools.		
05.02 Use special hand tools.		
05.03 Use precision measuring tools.		
05.04 Use power tools.		
05.05 Use fasteners.		
05.06 Use gaskets and choose sealants.		
06.0 Demonstrate proficiency in applying customer service skills--The student will be able to:		
06.01 Prepare service orders properly.		
06.02 Communicate solutions to customers.		
06.03 Follow manufacturers' service manuals.		
06.04 Locate parts in a parts catalog or on microfiche.		
07.0 Perform mathematical calculations--The student will be able to:		
07.01 Make job-related decimal and fraction calculations.		
07.02 Solve job-related problems by adding, subtracting, multiplying and dividing numbers.		
07.03 Solve job-related problems using a hand-held calculator.		
07.04 Solve job-related problems using basic formulas.		
07.05 Solve job-related problems using basic geometry.		
07.06 Measure a workpiece and compare measurements with blueprint specifications.		
07.07 Solve job-related problems using mathematical handbooks, charts, and tables.		
07.08 Convert measurements from English to metric and from metric to English units.		
08.0 Demonstrate ability to read plans and drawings--The student will be able to:		
08.01 Identify dimensions.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
08.02	Identify lists of materials and specifications.		
08.03	Identify section views/detail views.		
08.04	Sketch and dimension a part.		
08.05	Disassemble and assemble parts using an exploded view drawing.		
08.06	Interpret blueprint abbreviations.		
08.07	Identify dimensioning of radii, round holes, fillets, and chamfers.		
08.08	Identify screw threads and bolt types.		
08.09	Apply dimensional tolerances.		
08.10	Identify metal fabrication symbols used in blueprints.		
09.0	Perform measuring and layout operations--The student will be able to:		
09.01	Perform basic geometric construction.		
09.02	Use marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surface plates, depth gages, and circumference rules.		
09.03	Develop patterns using parallel line, radial lines, and triangulation.		
09.04	Make metal fabrication sketches.		
09.05	Read and measure with steel rules.		
09.06	Read and measure with micrometers.		
09.07	Read and measure with vernier tools.		
09.08	Read and measure with dial calipers.		
09.09	Read and measure with dial indicators.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 2**
Course Number: **8743020**
Course Credit: **1**

Course Description:

This course includes instruction in metal fabricating skills.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Engineering Assisting.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Engineering Assisting.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Describe metals and their properties--The student will be able to:		
10.01 Describe the steelmaking process.		
10.02 Describe the differences between ferrous and nonferrous metals.		
10.03 Describe casting, alloys, and forging.		
10.04 Identify metals such as galvanized iron and steel, aluminum, stainless steel, sheet metal, copper, and brass.		
10.05 Identify properties of the most common metals.		
10.06 Identify and describe common gages, shapes, and dimensions of purchased materials.		
11.0 Operate metalworking machines--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.01 Identify the purpose of various types of machine shop equipment.		
11.02 Operate a drill press utilizing the correct drilling speed.		
11.03 Operate a band saw utilizing the correct cutting speed.		
11.04 Demonstrate clamping devices for securing stock for drilling.		
11.05 Identify types and sizes of drill bits.		
11.06 Use portable power saw equipment.		
11.07 Use a cutoff or power hacksaw.		
11.08 Use electric and air utility grinders.		
11.09 Sharpen drill bits.		
11.10 Select proper type of abrasive wheels for grinding machines.		
12.0 Perform metal fabrication operations--The student will be able to:		
12.01 Fabricate metal, edges, and seams.		
12.02 Use hand tools to cut, punch, and shear metal.		
12.03 Form sheet metal using a brake, a folder, rolls, and a shear.		
12.04 Join metals using solder, rivets, and mechanical fasteners.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 3**
Course Number: **8743030**
Course Credit: **1**

Course Description:

This course includes instruction in welding and metal bonding.

Florida Standards			Correlation to CTE Program Standard #
13.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Assisting.		
	13.01 Key Ideas and Details		
	13.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	13.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	13.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	13.02 Craft and Structure		
	13.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	13.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	13.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
13.03	Integration of Knowledge and Ideas		
	13.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	13.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	13.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
13.04	Range of Reading and Level of Text Complexity		
	13.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	13.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
14.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Assisting.		
14.01	Text Types and Purposes		
	14.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	14.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	14.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
14.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	14.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	14.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	14.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
14.03	Research to Build and Present Knowledge		
	14.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	14.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	14.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
14.04	Range of Writing		
	14.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
15.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.		
15.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
15.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
15.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
15.04 Model with mathematics. MAFS.K12.MP.4.1	
15.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
15.06 Attend to precision. MAFS.K12.MP.6.1	
15.07 Look for and make use of structure. MAFS.K12.MP.7.1	
15.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Perform gas welding and cutting operations--The student will be able to:		
16.01 Identify welding cylinders, regulators, hoses, pressure gages, and torches.		
16.02 Describe welding equipment safety procedures.		
16.03 Demonstrate proper flame settings.		
16.04 Demonstrate basic gas welding skills.		
16.05 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.		
16.06 Demonstrate freehand and guide cutting of various metal thickness.		
17.0 Perform electric metal-bonding operations--The student will be able to:		
17.01 Describe and demonstrate the spot and arc welding process.		
17.02 Demonstrate basic procedures for safely adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions, and clamping.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.03 Set up and operate a spot welder.		
17.04 Explain and demonstrate the MIG welding process.		
17.05 Apply basic procedures for safely adjusting, operating, cleaning, and maintaining MIG welding equipment.		
17.06 Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips, and choosing filler metal.		
18.0 Perform bench work skills--The student will be able to:		
18.01 Cut materials by using hand hacksaws.		
18.02 Cut threads by using hand taps.		
18.03 Cut threads by using dies.		
18.04 Repair threads by chasing and thread inserts.		
18.05 Ream holes by using hand reamers.		
18.06 Hand-sharpen cutting tools by using abrasive stones.		
18.07 Hone and lap surfaces.		
18.08 Remove damaged screws and other hardware.		
18.09 Deburr work pieces.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 4**
Course Number: **8743040**
Course Credit: **1**

Course Description:

This course includes instruction in basic electricity and electronics.

Florida Standards			Correlation to CTE Program Standard #
13.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Engineering Assisting.		
	13.01 Key Ideas and Details		
	13.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	13.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	13.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	13.02 Craft and Structure		
	13.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	13.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	13.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
13.03	Integration of Knowledge and Ideas		
	13.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	13.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	13.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
13.04	Range of Reading and Level of Text Complexity		
	13.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	13.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
14.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Engineering Assisting.		
14.01	Text Types and Purposes		
	14.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	14.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	14.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
14.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	14.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	14.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	14.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
14.03	Research to Build and Present Knowledge		
	14.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	14.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	14.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
14.04	Range of Writing		
	14.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
15.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Engineering Assisting.		
15.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
15.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
15.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
15.04 Model with mathematics. MAFS.K12.MP.4.1	
15.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
15.06 Attend to precision. MAFS.K12.MP.6.1	
15.07 Look for and make use of structure. MAFS.K12.MP.7.1	
15.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Demonstrate knowledge of basic electricity and electronics--The student will be able to:		
19.01 Define electrical/electronic terms.		
19.02 Explain the theory and application of magnetism.		
19.03 Explain Ohm's Law.		
19.04 Describe DC and AC circuits.		
19.05 Demonstrate an entry-level understanding of electrical control equipment.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 5**
Course Number: **8743050**
Course Credit: **1**

Course Description:

This course includes instruction in maintaining two- and four-stroke engines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
20.0	Demonstrate proficiency in repairing and maintaining basic two-stroke cycle engines--The student will be able to:		
20.01	Explain the basic principles of the operation of the two-stroke cycle internal combustion engine.		
20.02	Identify types of engines.		
20.03	Locate engine serial and model numbers.		
20.04	Identify engine assemblies and systems.		
20.05	Disassemble engines.		
20.06	Remove, clean, and inspect the head for cracks, warpage, and damaged spark plug threads.		
20.07	Remove, clean, and inspect piston rods and assemblies.		
20.08	Measure out-of-round and cylinder taper.		
20.09	Check the total bearing surface of connecting rod bearings.		
20.10	Measure piston skirts and ring grooves.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
20.11	Measure the piston ring gap in the cylinder bore.		
20.12	Accurately fit piston to cylinder.		
20.13	Install piston pins according to manufacturer's specification.		
20.14	Check rod and piston assembly alignment.		
20.15	Install rings on pistons.		
20.16	Install piston rod assemblies.		
20.17	Check needle bearings.		
20.18	Inspect crankshafts and install seals.		
20.19	Inspect, clean, and/or replace reed valves.		
20.20	Reassemble engines.		
21.0	Demonstrate proficiency in repairing and maintaining basic four-stroke cycle engines--The student will be able to:		
21.01	Explain the basic principles of the operation of the four-stroke cycle internal combustion engine.		
21.02	Identify types of four-stroke cycle engines.		
21.03	Locate engine serial and model numbers.		
21.04	Identify engine assemblies and systems.		
21.05	Disassemble engines.		
21.06	Clean and inspect heads for cracks, warpage, and damaged spark plug threads.		
21.07	Inspect valves for warpage, burns, cracks, stem wear, tip wear, and margin.		
21.08	Grind valve seats and reface valves.		
21.09	Check and inspect springs for free height, distortion, and installed height.		
21.10	Adjust valve lash.		
21.11	Remove and inspect camshafts and lifters.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
21.12	Measure camshafts.		
21.13	Service camshaft bearings.		
21.14	Clear and inspect lifters for wear.		
21.15	Time valve drive assemblies.		
21.16	Remove piston from rod assemblies.		
21.17	Measure out-of-round and cylinder taper with a dial bore gage or micrometer.		
21.18	Check piston pins and bosses for wear.		
21.19	Measure piston ring lands width, out-of-round, and taper.		
21.20	Measure the piston ring gap in the cylinder bore.		
21.21	Install and fit piston pins.		
21.22	Check rod and piston assembly alignment.		
21.23	Remove and replace rod bearings.		
21.24	Hone and clean cylinders.		
21.25	Install rings on pistons.		
21.26	Measure and check crankshafts with a micrometer.		
21.27	Check for endplay.		
21.28	Check the bearing bore with a telescoping gage using special tools provided by the engine manufacturer.		
21.29	Reassemble engines.		
21.30	Install oil seals.		
22.0	Demonstrate proficiency in maintaining and repairing diesel engines--The student will be able to:		
22.01	Identify diesel engine operating principles (two- and four-stroke cycle engines).		
22.02	Identify components of two- and four-stroke cycle engines.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.03 Troubleshoot and repair cooling systems.		
22.04 Troubleshoot and repair lubrication systems.		
22.05 Troubleshoot and repair induction and exhaust systems.		
23.0 Maintain drive components--The student will be able to:		
23.01 Demonstrate safety procedures for maintaining drive components.		
23.02 Identify types of bearings.		
23.03 Remove, inspect, and/or replace bearings.		
23.04 Remove and replace seals.		
23.05 Perform shaft alignment.		
23.06 Identify types of belts.		
23.07 Identify types of chains.		
23.08 Perform tension adjustments on belt and chain drives.		
23.09 Troubleshoot belts and chain drives.		

Florida Department of Education
Student Performance Standards

Course Title: **Engineering Assisting 6**
Course Number: **8743060**
Course Credit: **1**

Course Description:

This course includes instruction in troubleshooting hydraulic and pneumatic systems and their components.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
24.0 Maintain piping and tubing--The student will be able to:		
24.01 Identify components of a piping system.		
24.02 Explain maintenance considerations of metallic and non-metallic piping system.		
24.03 Join copper tubing.		
24.04 Join common fittings.		
24.05 Join metallic pipe.		
24.06 Join plastic pipe.		
24.07 Explain valve operation and maintenance.		
25.0 Troubleshoot hydraulic and pneumatic systems--The student will be able to:		
25.01 Explain safety procedures for troubleshooting hydraulic and pneumatic systems.		
25.02 Read hydraulic and pneumatic schematics.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
25.03 Explain hydraulic and pneumatic troubleshooting techniques.		
25.04 Install hydraulic and pneumatic system components.		
25.05 Troubleshoot, repair, and install valves.		
25.06 Troubleshoot air compressors and hydraulic pumps.		
26.0 Handle and apply lubricants--The student will be able to:		
26.01 Explain the functions of lubrication.		
26.02 Explain the properties of oil lubricants and factors determining the selection of lubricants.		
26.03 Identify the types, advantage, and functions of lubricant additives.		
26.04 Identify grease application.		
26.05 Identify lubricating systems and methods.		
26.06 Explain lubricant storage and handling methods.		
26.07 Lubricate a piece of industrial equipment.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Industrial Machinery Maintenance and Repair**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8743100
CIP Number	0647030300
Grade Level	9-12, 30, 31
Standard Length	9 credits
Teacher Certification	TEC CONSTR @7 7G MILLWRIGHT 7G BLDG CONST @7 7G IND ENGR 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9041 – Industrial Machinery Mechanics
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in industrial-machinery maintenance positions.

The content includes but is not limited to understanding all aspects of the industrial-machinery maintenance-technology industry, and demonstrates elements of the industry such as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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 three occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8743210	Maintenance Skills 1	1 credit		2
	8743220	Maintenance Skills 2	1 credit		2
A	8743230	Maintenance Skills 3	1 credit	49-9041	2
	8743240	Machinery Maintenance 4	1 credit		2
	8743250	Machinery Maintenance 5	1 credit		2
B	8743260	Machinery Maintenance 6	1 credit	49-9041	2
	8743170	Industrial Maintenance 7	1 credit		2
	8743180	Industrial Maintenance 8	1 credit		2
C	8743190	Industrial Maintenance 9	1 credit	49-9041	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Maintenance Skills 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Maintenance Skills 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Maintenance Skills 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Machinery Maintenance 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Machinery Maintenance 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Machinery Maintenance 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Industrial Maintenance 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Industrial Maintenance 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Industrial Maintenance 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
04.0 Apply safety rules and procedures.
05.0 Explain the basic elements of physics as related to industrial machinery maintenance and repair.
06.0 Explain basic electricity and electronics.
07.0 Perform mathematical calculations.
08.0 Read plans and drawings.
09.0 Perform measuring and layout operations.
10.0 Use and maintain hand tools.
11.0 Use and maintain portable power tools.
12.0 Handle and apply lubricants.
13.0 Perform benchwork skills.
14.0 Perform gas and electric arc welding and cutting operations.
15.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
16.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
17.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.
18.0 Perform rigging functions.
19.0 Install and remove machinery.
20.0 Demonstrate conveyor-maintenance techniques.
21.0 Identify common troubles and basic troubleshooting techniques.
22.0 Plan an elementary predictive-preventive-maintenance (PPM) schedule.
23.0 Perform gas- and arc-welding procedures.
24.0 Perform machine-shop operations.
25.0 Maintain piping and tubing systems.
26.0 Troubleshoot electrical circuits.
27.0 Install and maintain drive components.
28.0 Maintain reciprocating, positive-displacement, and rotary air compressors.
29.0 Maintain and repair hydraulic-system components.
30.0 Troubleshoot hydraulic systems.
31.0 Maintain and troubleshoot pneumatic systems.

32.0 Maintain and troubleshoot fluid-drive systems.
33.0 Maintain and troubleshoot robotic systems.
34.0 Perform pump maintenance and repair.
35.0 Explain the operation of industrial-pollution control systems.
36.0 Troubleshoot air-conditioning and refrigeration systems.
37.0 Identify boilers.
38.0 Maintain internal combustion engines.
39.0 Prepare for machinery startup.
40.0 Apply vibration-analysis skills.
41.0 Perform machinery balancing.
42.0 Demonstrate predictive-preventive-maintenance (PPM) technologies.
43.0 Use computer-maintenance-management systems (CMMS).
44.0 Perform failure analysis (FA).
45.0 Improve rotating-equipment performance.
46.0 Generate machine improvements and maintenance management.

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 1**
Course Number: **8743210**
Course Credit: **1**

Course Description:

This course develops the competencies of applying safety rules and procedures, relating the basic elements of physics and of electricity and electronics to Industrial Machinery Maintenance and Repair, performing mathematical calculations, reading plans and drawings, performing measuring and layout operations, and performing computer applications in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Apply safety rules and procedures--The student will be able to:		
04.01 Practice shop safety rules and procedures.		
04.02 Practice personal safety rules and procedures.		
04.03 Practice fire safety rules and procedures.		
04.04 Practice electrical safety rules and procedures.		
04.05 Practice tool safety rules and procedures.		
04.06 Practice ladder and scaffolding safety rules and procedures.		
04.07 Maintain a clean work and shop area.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.08	Perform tag lockout procedures.		
04.09	Identify Occupational Safety and Health Administration (OSHA) requirements and procedures.		
04.10	Use Materials Safety Data Sheets (MSDS).		
05.0	Explain the basic elements of physics as related to industrial machinery maintenance and repair--The student will be able to:		
05.01	Explain the standards of measurement and the impact of action and working forces, including tension, compression, torque, and shear.		
05.02	Identify the principles and laws of motion and explain how they affect acceleration and deceleration.		
05.03	Explain the relationship of work, power, and energy to the types of collisions and the conservation of momentum.		
05.04	Explain the operation of simple machines, including the lever, inclined plane, screw, wedge, wheel and axle, pulley, and jacking screws.		
05.05	Identify the ways of producing power for mechanical efficiency, in terms of gear ratios, work forces, and types of work done by a crane hook, forklift truck, and screw or bolt.		
05.06	Use linear, liquid, and weight units of measurement to measure areas, areas within areas, and volume.		
05.07	Describe the mechanical and chemical properties of materials commonly used in industry.		
05.08	Explain the laws and conditions governing static and kinetic friction, the problems caused by friction, and the effects of the angle of repose.		
05.09	Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
05.10	Draw conclusions or make inferences from data.		
05.11	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
05.12	Explain pressure measurement in terms of pounds per square inch (PSI), inches of mercury, and Kilopascal (kPa).		
06.0	Explain basic electricity and electronics--The student will be able to:		
06.01	Define electrical/electronics terms.		
06.02	Explain the theory and application of magnetism.		
06.03	Explain Ohm's law.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.04 Describe direct current (DC) and alternating current (AC) circuits.		
06.05 Identify the advantages and disadvantages of alternating current (AC) and direct current (DC) motors for various applications.		
06.06 Describe the use of programmable logic controllers (PLCs) in industry.		
07.0 Perform mathematical calculations--The student will be able to:		
07.01 Make job-related decimal and fraction calculations.		
07.02 Solve job-related problems by adding, subtracting, multiplying, and dividing numbers.		
07.03 Solve job-related problems using a hand-held calculator.		
07.04 Solve job-related problems using basic formulas.		
07.05 Solve job-related problems using basic geometry.		
07.06 Measure a work piece and compare the measurements with blueprint specifications.		
07.07 Solve job-related problems using mathematical handbooks, charts, and tables.		
07.08 Convert measurements from English to metric and from metric to English units.		
07.09 Solve job-related problems using proportions.		
07.10 Solve job-related problems using statistics.		
08.0 Read plans and drawings--The student will be able to:		
08.01 Identify dimensions.		
08.02 Identify lists of materials and specifications.		
08.03 Identify section and detail views.		
08.04 Sketch and dimension a part.		
08.05 Disassemble and assemble parts using an exploded-view drawing.		
08.06 Interpret blueprint abbreviations.		
08.07 Identify dimensioning of radii, round holes, fillets, and chamfers.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.08 Identify screw threads and bolt types.		
08.09 Apply dimensional tolerances.		
08.10 Identify the metal-fabrication symbols used in blueprints.		
09.0 Perform measuring and layout operations--The student will be able to:		
09.01 Perform basic geometric-construction operations.		
09.02 Safely use marking gauges, center punches, scribes, surface gauges, squares, dividers, dial indicators, protractors, surface plates, depth gauges, and circumference rules.		
09.03 Develop patterns using parallel lines, radial lines, and triangulation.		
09.04 Make metal-fabrication sketches.		
09.05 Read and measure with steel rules.		
09.06 Read and measure with micrometers.		
09.07 Read and measure with vernier tools.		
09.08 Read and measure with dial calipers.		
09.09 Read and measure with dial indicators.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 2**
Course Number: **8743220**
Course Credit: **1**

Course Description:

This course develops the competencies of using and maintaining hand and portable power tools, handling and applying lubricants, applying basic bench work skills, and performing basic gas-welding and cutting operations in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Use and maintain hand tools--The student will be able to:		
10.01 Demonstrate the safe use of hand tools such as screwdrivers, hammers, wrenches, pliers, hacksaws, punches, chisels, drills, files, tin snips, taps, and dies.		
10.02 Use measuring devices.		
10.03 Use wrenches and screwdrivers.		
10.04 Use pipefitting tools.		
10.05 Use sheet-metal tools.		
10.06 Safely use ropes, slings, pulleys, and block and tackle.		
10.07 Select the proper tool for each job application.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.08	Select correct tools for metric and standard fasteners.		
10.09	Identify state-of-the-art innovations and explore their uses.		
10.10	Identify and select fasteners for various applications, taking into account the effects of corrosion on each, including threaded fasteners, nuts, washers, rivets, locking pins, keys, self-tapping screws, locking-nut fasteners, and self-retaining nuts.		
10.11	Describe the techniques and liability issues regarding retrofitting fasteners for ease of removal.		
11.0	Use and maintain portable power tools--The student will be able to:		
11.01	Demonstrate the safe use of portable power tools such as drills, belt and disc sanders, grinders, circular saws, saber saws, metal shears, electric and pneumatic impact wrenches, rotary and pneumatic chipping hammers, drill presses, and bench grinders.		
11.02	Use and maintain light- and heavy-duty drills.		
11.03	Use and maintain electric hammers.		
11.04	Use and maintain pneumatic drills and hammers.		
11.05	Use and maintain power screwdrivers and nut runners.		
11.06	Use and maintain linear-motion saws.		
11.07	Use and maintain circular saws.		
11.08	Use and maintain belt, pad, and disc sanders.		
11.09	Use and maintain grinders and shears.		
12.0	Handle and apply lubricants--The student will be able to:		
12.01	Explain the functions of lubrication.		
12.02	Explain the properties of oil lubricants and the factors determining the selection of lubricants.		
12.03	Identify the types, advantages, and functions of lubricant additives.		
12.04	Explain the types of circulating oils and their purposes.		
12.05	Identify grease application.		
12.06	Identify lubricating systems and methods.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.07 Explain lubricant storage and handling methods.		
12.08 Explain the types of oil filters and their uses.		
12.09 Lubricate a piece of industrial equipment.		
12.10 Define the role of preventive maintenance in total equipment maintenance.		
12.11 Describe the major tasks of preventive maintenance: cleaning, inspection, lubrication, minor repair, and information feedback.		
12.12 Review a typical maintenance program.		
13.0 Perform benchwork skills--The student will be able to:		
13.01 Identify safety and shop rules.		
13.02 Cut materials by using hand hacksaws.		
13.03 Cut threads by using hand taps.		
13.04 Cut threads by using dies.		
13.05 Repair threads by chasing and thread inserts.		
13.06 Install dowel pins using tapered and straight reamers.		
13.07 Ream holes by using tapered and straight reamers.		
13.08 Hand-sharpen cutting tools by using abrasive stones.		
13.09 Hone and lap surfaces.		
13.10 Remove damaged screws and other hardware.		
13.11 Deburr workpieces.		
14.0 Perform gas and electric arc welding and cutting operations--The student will be able to:		
14.01 Identify the properties of the most commonly used metals and alloys, including hardness and malleability.		
14.02 Identify the processes and effects of tempering, annealing, and case hardening.		
14.03 Identify welding cylinders, regulators, hoses, pressure gauges, and torches.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.04 Describe welding-equipment safety procedures.		
14.05 Demonstrate proper flame settings.		
14.06 Demonstrate basic gas-welding skills.		
14.07 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.		
14.08 Demonstrate freehand and guide cutting of various metal thicknesses.		
14.09 Identify the uses of the following welding techniques: laser, ultrasonic, resistance, and percussion.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 3**
Course Number: **8743230**
Course Credit: **1**

Course Description:

This course develops competencies in rigging and lifting, installing and removing machinery, conveyor maintenance, troubleshooting machinery performance, communicating, servicing customers, obtaining employment, and entrepreneurship skills in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards		Correlation to CTE Program Standard #
15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
15.03	Integration of Knowledge and Ideas	
15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity	
15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.	
16.01	Text Types and Purposes	
16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
16.02	Production and Distribution of Writing		
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		

Florida Standards	Correlation to CTE Program Standard #
17.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.0 Perform rigging functions--The student will be able to:		
18.01 Demonstrate the safety procedures for performing rigging and lifting operations.		
18.02 Identify and inspect fiber and wire rope.		
18.03 Tie knots and hitches.		
18.04 Identify and use the components of rigging hardware.		
18.05 Perform rigging and lifting operations.		
18.06 Demonstrate the proper operation of a forklift.		
19.0 Install and remove machinery--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.01 Identify the safety procedures for installing and removing machinery.		
19.02 Identify the equipment required for machine installation and removal.		
19.03 Prepare an area for machine installation per the manufacturer's specifications.		
19.04 Rig, lift, and transport machinery to the installation site.		
19.05 Install electrical hookups to machinery.		
19.06 Install air hydraulic hookups to machinery.		
19.07 Perform an assigned machine retrofit per manufacturer's specifications.		
19.08 Perform an assigned machine removal and transport per specification requirements.		
19.09 Explain the importance of vibration detection.		
19.10 Identify the need for pipe supports to prevent pipe stress.		
20.0 Demonstrate conveyor-maintenance techniques--The student will be able to:		
20.01 Identify the types of conveyors.		
20.02 Identify the safety requirements and precautions for conveyor-maintenance operations.		
20.03 Adjust the tracking of a belt.		
20.04 Check a belt for wear.		
20.05 Identify the types of splices.		
20.06 Identify splicing equipment and procedures.		
20.07 Demonstrate conveyor-maintenance techniques, including making splices with splicing equipment.		
21.0 Identify common troubles and basic troubleshooting techniques--The student will be able to:		
21.01 Analyze the possible causes of common troubles in industrial-machinery performance.		
21.02 Identify basic troubleshooting techniques for bearings.		
21.03 Identify basic troubleshooting techniques for pumps.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.04 Identify basic troubleshooting techniques for drive systems.		
21.05 Identify basic troubleshooting techniques for electrical circuits.		
21.06 Identify basic troubleshooting techniques for hydraulics.		
21.07 Identify basic troubleshooting techniques for pneumatics.		
21.08 Identify basic troubleshooting techniques for PLCs.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 4**
Course Number: **8743240**
Course Credit: **1**

Course Description:

This course develops the competencies of planning an elementary predictive- preventive-maintenance schedule, performing gas and arc welding, performing machine-shop operations, maintaining piping and tubing systems, troubleshooting electrical circuits, and maintaining and installing drive components in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
15.03	Integration of Knowledge and Ideas		
	15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity		
	15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		
16.01	Text Types and Purposes		
	16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
16.02	Production and Distribution of Writing		
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Industrial Machinery Maintenance and Repair.		

Florida Standards	Correlation to CTE Program Standard #
17.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.0 Plan an elementary predictive - preventive - maintenance (PPM) schedule--The student will be able to:		
22.01 List the types of predictive-preventive maintenance.		
22.02 Describe the purpose of preventive-maintenance schedules.		
22.03 Create a preventive-maintenance schedule form using a machine manual or the manufacturer's recommendations.		
22.04 Identify troubles caused by the lack of preventive maintenance.		
22.05 Create a maintenance log and make entries for a machine or equipment.		
22.06 Create a preventive-maintenance schedule from a maintenance- failure log.		
23.0 Perform gas- and arc-welding procedures--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.01 Demonstrate the safety procedures for performing gas and arc welding and for transporting equipment.		
23.02 Identify the components of an oxyfuel rig.		
23.03 Set up and shut down an oxyfuel rig.		
23.04 Weld beads in a flat position.		
23.05 Weld an outside corner joint using a filler rod.		
23.06 Cut metal of various thicknesses'.		
23.07 Weld beads in a flat position using E-6010 and E-7018 electrodes.		
23.08 Weld beads in horizontal and in vertical positions using E-6010 and E-7018 electrodes.		
23.09 Weld beads in an overhead position using E-6010 and E-7018 electrodes.		
23.10 Weld beads using a MIG welder.		
23.11 Weld beads using a TIG welder.		
23.12 Solder and braze metals.		
23.13 Cut stainless steel and aluminum with a plasma-arc rig.		
24.0 Perform machine-shop operations--The student will be able to:		
24.01 Demonstrate safety in performing machine-shop operations.		
24.02 Identify the types of cutting tools.		
24.03 Bore a hole to a specified size.		
24.04 Chase an external V-thread.		
24.05 Identify the different types of work-holding devices.		
24.06 Prepare metal for finishing.		
24.07 Set up, use, and adjust an arbor press.		
24.08 Set up, use, and adjust a hydraulic press.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
24.09 Set up, use, and adjust broaching tools.		
24.10 Cut keyways with an end mill.		
25.0 Maintain piping and tubing systems--The student will be able to:		
25.01 Identify the components of a piping system.		
25.02 Explain the maintenance considerations of metallic and nonmetallic piping systems.		
25.03 Describe the safety requirements for working with piping and tubing systems.		
25.04 Join copper tubing.		
25.05 Join common fittings.		
25.06 Join metallic pipe.		
25.07 Join plastic pipe.		
25.08 Explain valve operation and maintenance.		
25.09 Explain the importance of strainers, filters, and traps in piping systems.		
25.10 Bend back-to-back, stub-ups, and doglegs in electrical metallic tubing (EMT).		
26.0 Troubleshoot electrical circuits--The student will be able to:		
26.01 Describe the safety requirements and precautions for troubleshooting electrical circuits.		
26.02 Disconnect and reconnect electric motors.		
26.03 Identify the parts and function of electrical control equipment.		
26.04 Define digital devices and PLC logic/ladder logic to troubleshoot.		
26.05 Identify the function of input and output devices and the controller.		
26.06 Explain how to troubleshoot a sequence of events.		
26.07 Use and maintain electrical test equipment for troubleshooting.		
27.0 Install and maintain drive components--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.01 Demonstrate safety procedures for installing and maintaining drive components.		
27.02 Identify types of bearings, their cross-referencing, and their uses.		
27.03 Remove, inspect, and/or replace bearings.		
27.04 Remove and replace seals.		
27.05 Perform shaft alignment.		
27.06 Identify the types of belts.		
27.07 Identify the types of chains.		
27.08 Perform tension adjustments and alignment on belt and chain drives.		
27.09 Troubleshoot belt and chain drives.		
27.10 Identify the types of gears.		
27.11 Remove, replace, and align gears, sprockets, and couplings.		
27.12 Remove, replace, or repair V-joints and jack shafts.		
27.13 Adjust gear backlash.		
27.14 Troubleshoot gear drives.		
27.15 Disassemble, inspect, reassemble, and adjust clutches.		
27.16 Identify the types of variable-speed drives.		
27.17 Troubleshoot variable-speed drives.		
27.18 Identify the types of cams and link mechanisms.		
27.19 Troubleshoot cam-and-link mechanism problems.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 5**
Course Number: **8743250**
Course Credit: **1**

Course Description:

This course develops the competencies of maintaining specific types of air compressors and maintaining, repairing, and troubleshooting fluid-drive systems in the industrial-machinery maintenance-technology industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.0	Maintain reciprocating, positive-displacement, and rotary air compressors--The student will be able to:		
28.01	Relate force, weight, mass, and density to a pneumatic system.		
28.02	Demonstrate safety procedures for maintaining reciprocating, positive-displacement, and rotary air compressors.		
28.03	Demonstrate the operation of reciprocating compressors.		
28.04	Demonstrate the operation of positive-displacement and rotary air compressors.		
28.05	Demonstrate primary and secondary air treatment.		
28.06	Demonstrate the operation of valves, cylinders, and motors.		
28.07	Check oil level.		
28.08	Change oil.		
28.09	Drain water from tank.		
28.10	Test for efficiency of compressor.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
28.11 Inspect storage tank for quality.		
28.12 Test pressure control switch.		
29.0 Maintain and repair hydraulic-system components--The student will be able to:		
29.01 Explain the safety procedures for installing hydraulic lines.		
29.02 Explain Pascal's law.		
29.03 Explain Bernoulli's principle.		
29.04 Explain how heat and pressure relate to power and transmission.		
29.05 Describe the physical and chemical properties of a fluid.		
29.06 Install and maintain a contaminant-removal system.		
29.07 Determine reservoir requirements.		
29.08 Classify and select pumps for specific applications.		
29.09 Compute hose requirements.		
29.10 Install hydraulic lines.		
29.11 Select and install control valves.		
30.0 Troubleshoot hydraulic systems--The student will be able to:		
30.01 Explain the safety procedures for troubleshooting hydraulic systems.		
30.02 Read a hydraulic schematic.		
30.03 Install hydraulic components.		
30.04 Connect electrically controlled valves.		
30.05 Explain hydraulic-system troubleshooting techniques.		
30.06 Repair and replace valves.		
30.07 Repair and replace cylinders.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
30.08 Repair and replace pumps and motors.		
31.0 Maintain and troubleshoot pneumatic systems--The student will be able to:		
31.01 Explain the safety procedures for troubleshooting pneumatic systems.		
31.02 Diagram an air-supply system.		
31.03 Install system components.		
31.04 Demonstrate system-maintenance techniques.		
31.05 Explain proper troubleshooting procedures.		
31.06 Troubleshoot air compressors.		
31.07 Troubleshoot, repair, and install control valves.		
31.08 Troubleshoot air motors.		
32.0 Maintain and troubleshoot fluid-drive systems--The student will be able to:		
32.01 Explain the safety procedures for maintaining and troubleshooting fluid-drive systems.		
32.02 Install adjustable speed drives.		
32.03 Troubleshoot adjustable speed drives.		
32.04 Explain the operation of fluid couplings.		
32.05 Install fluid couplings.		
32.06 Install torque converters.		
32.07 Perform preventive maintenance.		
32.08 Apply a "dynamic" magnetic/mechanical braking device to a motor.		
32.09 Mount the equipment.		
33.0 Maintain and troubleshoot robotic systems--The student will be able to:		
33.01 Identify uses of robotics in industry.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
33.02 Identify safety procedures related to robotic systems.		
33.03 Identify mechanical, hydraulic, pneumatic, and electric/electronic components of robotic systems.		
33.04 Perform routine maintenance and calibration of robotic systems.		
33.05 Remove, replace and adjust robotic system components.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 6**
Course Number: **8743260**
Course Credit: **1**

Course Description:

This course develops the competencies for pump maintenance and repair and for pollution control along with knowledge of industrial-pollution control systems in industrial-machinery maintenance-technology operations. It may include the development of optional competencies related to air-conditioning and refrigeration, boilers, and small engines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
34.0 Perform pump maintenance and repair--The student will be able to:		
34.01 Demonstrate the safety procedures for performing pump maintenance.		
34.02 Determine pump capacity and system requirements.		
34.03 Perform pump maintenance.		
34.04 Identify packing and seal requirements.		
34.05 Explain the operating principles of centrifugal, propeller and turbine rotary, reciprocating, diaphragm, positive placement, and vacuum pumps.		
34.06 Disassemble and reassemble a pump.		
35.0 Explain the operation of industrial-pollution control systems--The student will be able to:		
35.01 Explain the operation of air-pollution control systems.		
35.02 Explain the operation of water-pollution control systems.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
35.03 Explain the operation of solid-waste pollution control systems.		
35.04 Explain the operation of noise-pollution control systems.		
36.0 Troubleshoot air-conditioning and refrigeration systems--The student will be able to:		
36.01 Explain the principles of refrigeration.		
36.02 Identify the major components.		
36.03 Describe the functions of electrical systems.		
36.04 Troubleshoot air-conditioning and refrigeration systems.		
36.05 Explain the requirement for recovery of hazardous materials and related safety procedures.		
37.0 Identify boilers--The student will be able to:		
37.01 Identify the various types and components of heat exchangers.		
37.02 Identify the various types and components of boilers.		
37.03 Identify the various types and components of fractioning columns.		
37.04 Identify the uses of steam.		
38.0 Maintain internal combustion engines--The student will be able to:		
38.01 Explain the basic principles of operation of the two-stroke-cycle combustion engine.		
38.02 Identify the types of engines.		
38.03 Locate engine serial and model numbers.		
38.04 Identify engine assemblies and systems.		
38.05 Troubleshoot and evaluate engine performance.		
38.06 Perform routine maintenance on engine operating systems including air intake and exhaust, fuel, lubrication, starting and governing.		
38.07 Perform engine tune-up and adjustment procedures		
38.08 Remove and replace engine assemblies.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 7**
Course Number: **8743270**
Course Credit: **1**

Course Description:

This course develops the competencies for preparing for machinery startup and performing vibration analysis and machine balancing for specialized operations in the industrial-machinery maintenance-technology industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
39.0	Prepare for machinery startup--The student will be able to:		
39.01	Perform the requirements and precautions for machinery startup.		
39.02	Align machinery using wire line, transit, dial indicators, a computer, and laser-alignment devices.		
39.03	Position and secure machinery on a foundation.		
39.04	Level machinery and install balance-vibration dampers.		
39.05	Identify pipe-stress standards for machine-maintenance applications.		
39.06	Perform finish alignment and check for pipe stresses in machinery-maintenance applications.		
40.0	Apply vibration-analysis skills--The student will be able to:		
40.01	Collect vibration data.		
40.02	Interpret vibration data.		
40.03	Determine velocity, acceleration, spike energy, frequency, amplitude, and other vibration sources.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
40.04 Describe the safety requirements and precautions for vibration analysis.		
40.05 Operate and use vibration software.		
40.06 Predict and verify the condition of machinery in an industrial setting using vibration tools.		
40.07 Explain the approximately 25 sources of vibration.		
40.08 Explain the bearing frequency (BIFO) formulas.		
40.09 Determine proficiency in vibration detection.		
41.0 Perform machinery balancing--The student will be able to:		
41.01 Describe the safety requirements and precautions for balancing procedures and equipment.		
41.02 Identify the principles of static balancing.		
41.03 Perform a vector balance in the classroom.		
41.04 Identify balancing standards, ISO 1940 or equal.		
41.05 Perform a stand balance in a shop.		
41.06 Perform a field balance in an industrial setting.		
41.07 Use portable or stationary balancing equipment.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 8**
Course Number: **8743280**
Course Credit: **1**

Course Description:

This course develops the competencies for preparing for machinery startup and performing vibration analysis and machine balancing for specialized operations in the industrial-machinery maintenance-technology industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
42.0 Demonstrate predictive-preventive-maintenance (PPM) technologies--The student will be able to:		
42.01 Explain the use of infrared thermography.		
42.02 Explain the use of ultrasound technology.		
42.03 Explain the use of advanced alignment techniques (optical and Essinger bars).		
42.04 Explain the use of oil ferrography and the types of oil sampling.		
42.05 Explain the use of shock pulse equipment.		
42.06 Describe the safety requirements for PPM technologies.		
42.07 Determine the use of one of the above predictive-maintenance procedures.		
42.08 Plan an advanced PPM schedule.		
43.0 Use computer-maintenance-management systems (CMMS)--The student will be able to:		
43.01 Operate CMMS software.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
43.02 Enter and close a maintenance work order with CMMS.		
43.03 Schedule a series of maintenance tasks.		
43.04 Write a detailed maintenance job plan.		
43.05 Order parts and supplies for a maintenance work order.		
43.06 Determine the personnel resources needed for a maintenance job.		
44.0 Perform failure analysis (FA)--The student will be able to:		
44.01 Conduct/lead a failure-analysis meeting to determine the root cause of a failure.		
44.02 Create a failure-analysis form and write a minimum of two different types of failure-analysis reports.		
44.03 Explain the types of bearing failure.		
44.04 Explain the types of shaft fatigues and failures.		
44.05 Explain the types of lubrication breakdowns.		
44.06 Estimate the cost and the impact on production of a specific failure.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 9**
Course Number: **8743290**
Course Credit: **1**

Course Description:

This course develops the competencies for preparing for machinery startup and performing vibration analysis and machine balancing for specialized operations in the industrial-machinery maintenance-technology industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
45.0	Improve rotating-equipment performance--The student will be able to:		
45.01	Calculate shaft-deflection ratios and use the results to improve shaft design.		
45.02	Draw or sketch equipment bases and supports of sturdy construction.		
45.03	Determine and install advanced labyrinth-sealing devices.		
45.04	Determine and install advanced mechanical-sealing devices.		
45.05	Run the Gates Belts or another interactive belt-design-and-tensioning computer program applied to various drives.		
45.06	Explain the benefits of synthetic oils and greases.		
45.07	Explain MTBF (mean time between equipment failure) and its cost impact when machinery life is extended.		
45.08	List seven specific machinery-improvement ideas in detail.		
46.0	Generate machine improvements and maintenance management--The student will be able to:		
46.01	Review and critique machinery and base design for improvement, before the equipment is placed on order.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
46.02	Identify the essential elements of effective maintenance management:		
	a. Reward system		
	b. Predictive-preventive maintenance		
	c. Planning		
	d. Work-order systems		
	e. Organizations		
	f. Goals and tracking		
	g. Facilities		
	h. Storerooms		
	i. Contractors		
	j. Shutdowns		
46.03	Write a report on the design and effective use of at least two of the essential elements of management.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Industrial Machinery Maintenance and Repair programs:

Industrial Machinery Maintenance and Repair - I470303 (0647030300)
Industrial Machinery Maintenance 1 - J590100 (0647030303)
Industrial Machinery Maintenance 2 - J590200 (0647030304)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Millwright**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8743200
CIP Number	0647030302
Grade Level	9-12, 30, 31
Standard Length	9 credits
Teacher Certification	TEC CONSTR @7 7G MILLWRIGHT 7G BLDG CONST @7 7G IND ENGR 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9041 – Industrial Machinery Mechanics 49-9044 – Millwrights
Facility Code	203 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in millwright positions.

The content includes but is not limited to understanding all aspects of the industrial-machinery maintenance and millwright industry, and demonstrates elements of the industry such as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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 three occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8743210	Maintenance Skills 1	1 credit		2
	8743220	Maintenance Skills 2	1 credit		2
A	8743230	Maintenance Skills 3	1 credit	49-9041	2
	8743240	Machinery Maintenance 4	1 credit		2
	8743250	Machinery Maintenance 5	1 credit		2
B	8743260	Machinery Maintenance 6	1 credit	49-9041	2
	8743270	Millwright 7	1 credit		2
	8743280	Millwright 8	1 credit		2
C	8743290	Millwright 9	1 credit	49-9044	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Maintenance Skills 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Maintenance Skills 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Maintenance Skills 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Machinery Maintenance 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Machinery Maintenance 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Machinery Maintenance 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Millwright 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Millwright 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Millwright 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Millwright.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Millwright.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Millwright.
04.0 Apply safety rules and procedures.
05.0 Explain the basic elements of physics as related to industrial machinery maintenance and repair.
06.0 Explain basic electricity and electronics.
07.0 Perform mathematical calculations.
08.0 Read plans and drawings.
09.0 Perform measuring and layout operations.
10.0 Use and maintain hand tools.
11.0 Use and maintain portable power tools.
12.0 Handle and apply lubricants.
13.0 Perform benchwork skills.
14.0 Perform gas and electric arc welding and cutting operations.
15.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Millwright.
16.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Millwright.
17.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Millwright.
18.0 Perform rigging functions.
19.0 Install and remove machinery.
20.0 Demonstrate conveyor-maintenance techniques.
21.0 Identify common troubles and basic troubleshooting techniques.
22.0 Plan an elementary predictive-preventive-maintenance (PPM) schedule.
23.0 Perform gas- and arc-welding procedures.
24.0 Perform machine-shop operations.
25.0 Maintain piping and tubing systems.
26.0 Troubleshoot electrical circuits.
27.0 Install and maintain drive components.
28.0 Maintain reciprocating, positive-displacement, and rotary air compressors.
29.0 Maintain and repair hydraulic-system components.
30.0 Troubleshoot hydraulic systems.
31.0 Maintain and troubleshoot pneumatic systems.
32.0 Maintain and troubleshoot fluid-drive systems.
33.0 Maintain and troubleshoot robotic systems.
34.0 Perform pump maintenance and repair.
35.0 Explain the operation of industrial-pollution control systems.

36.0 Troubleshoot air-conditioning and refrigeration systems.
37.0 Identify boilers.
38.0 Maintain internal combustion engines.
39.0 Perform metal fabrication.
40.0 Perform precision layout.
41.0 Perform advanced rigging.
42.0 Install, remove and align machinery.

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 1**
Course Number: **8743210**
Course Credit: **1**

Course Description:

This course develops the competencies of applying safety rules and procedures, relating the basic elements of physics and of electricity and electronics to Industrial Machinery Maintenance and Repair, performing mathematical calculations, reading plans and drawings, performing measuring and layout operations, and performing computer applications in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Millwright.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Millwright.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Millwright.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Apply safety rules and procedures--The student will be able to:		
04.01 Practice shop safety rules and procedures.		
04.02 Practice personal safety rules and procedures.		
04.03 Practice fire safety rules and procedures.		
04.04 Practice electrical safety rules and procedures.		
04.05 Practice tool safety rules and procedures.		
04.06 Practice ladder and scaffolding safety rules and procedures.		
04.07 Maintain a clean work and shop area.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
04.08	Perform tag lockout procedures.		
04.09	Identify Occupational Safety and Health Administration (OSHA) requirements and procedures.		
04.10	Use Materials Safety Data Sheets (MSDS).		
05.0	Explain the basic elements of physics as related to Millwright--The student will be able to:		
05.01	Explain the standards of measurement and the impact of action and working forces, including tension, compression, torque, and shear.		
05.02	Identify the principles and laws of motion and explain how they affect acceleration and deceleration.		
05.03	Explain the relationship of work, power, and energy to the types of collisions and the conservation of momentum.		
05.04	Explain the operation of simple machines, including the lever, inclined plane, screw, wedge, wheel and axle, pulley, and jacking screws.		
05.05	Identify the ways of producing power for mechanical efficiency, in terms of gear ratios, work forces, and types of work done by a crane hook, forklift truck, and screw or bolt.		
05.06	Use linear, liquid, and weight units of measurement to measure areas, areas within areas, and volume.		
05.07	Describe the mechanical and chemical properties of materials commonly used in industry.		
05.08	Explain the laws and conditions governing static and kinetic friction, the problems caused by friction, and the effects of the angle of repose.		
05.09	Explain molecular action as a result of temperature extremes, chemical reaction, and moisture content.		
05.10	Draw conclusions or make inferences from data.		
05.11	Identify health-related problems that may result from exposure to work-related chemicals and hazardous materials, and know the proper precautions required for handling such materials.		
05.12	Explain pressure measurement in terms of pounds per square inch (PSI), inches of mercury, and Kilopascal (kPa).		
06.0	Explain basic electricity and electronics--The student will be able to:		
06.01	Define electrical/electronics terms.		
06.02	Explain the theory and application of magnetism.		
06.03	Explain Ohm's law.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.04 Describe direct current (DC) and alternating current (AC) circuits.		
06.05 Identify the advantages and disadvantages of alternating current (AC) and direct current (DC) motors for various applications.		
06.06 Describe the use of programmable logic controllers (PLCs) in industry.		
07.0 Perform mathematical calculations--The student will be able to:		
07.01 Make job-related decimal and fraction calculations.		
07.02 Solve job-related problems by adding, subtracting, multiplying, and dividing numbers.		
07.03 Solve job-related problems using a hand-held calculator.		
07.04 Solve job-related problems using basic formulas.		
07.05 Solve job-related problems using basic geometry.		
07.06 Measure a work piece and compare the measurements with blueprint specifications.		
07.07 Solve job-related problems using mathematical handbooks, charts, and tables.		
07.08 Convert measurements from English to metric and from metric to English units.		
07.09 Solve job-related problems using proportions.		
07.10 Solve job-related problems using statistics.		
08.0 Read plans and drawings--The student will be able to:		
08.01 Identify dimensions.		
08.02 Identify lists of materials and specifications.		
08.03 Identify section and detail views.		
08.04 Sketch and dimension a part.		
08.05 Disassemble and assemble parts using an exploded-view drawing.		
08.06 Interpret blueprint abbreviations.		
08.07 Identify dimensioning of radii, round holes, fillets, and chamfers.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.08 Identify screw threads and bolt types.		
08.09 Apply dimensional tolerances.		
08.10 Identify the metal-fabrication symbols used in blueprints.		
09.0 Perform measuring and layout operations--The student will be able to:		
09.01 Perform basic geometric-construction operations.		
09.02 Safely use marking gauges, center punches, scribes, surface gauges, squares, dividers, dial indicators, protractors, surface plates, depth gauges, and circumference rules.		
09.03 Develop patterns using parallel lines, radial lines, and triangulation.		
09.04 Make metal-fabrication sketches.		
09.05 Read and measure with steel rules.		
09.06 Read and measure with micrometers.		
09.07 Read and measure with vernier tools.		
09.08 Read and measure with dial calipers.		
09.09 Read and measure with dial indicators.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 2**
Course Number: **8743220**
Course Credit: **1**

Course Description:

This course develops the competencies of using and maintaining hand and portable power tools, handling and applying lubricants, applying basic bench work skills, and performing basic gas-welding and cutting operations in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Millwright.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Millwright.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Millwright.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Use and maintain hand tools--The student will be able to:		
10.01 Demonstrate the safe use of hand tools such as screwdrivers, hammers, wrenches, pliers, hacksaws, punches, chisels, drills, files, tin snips, taps, and dies.		
10.02 Use measuring devices.		
10.03 Use wrenches and screwdrivers.		
10.04 Use pipefitting tools.		
10.05 Use sheet-metal tools.		
10.06 Safely use ropes, slings, pulleys, and block and tackle.		
10.07 Select the proper tool for each job application.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
10.08	Select correct tools for metric and standard fasteners.		
10.09	Identify state-of-the-art innovations and explore their uses.		
10.10	Identify and select fasteners for various applications, taking into account the effects of corrosion on each, including threaded fasteners, nuts, washers, rivets, locking pins, keys, self-tapping screws, locking-nut fasteners, and self-retaining nuts.		
10.11	Describe the techniques and liability issues regarding retrofitting fasteners for ease of removal.		
11.0	Use and maintain portable power tools--The student will be able to:		
11.01	Demonstrate the safe use of portable power tools such as drills, belt and disc sanders, grinders, circular saws, saber saws, metal shears, electric and pneumatic impact wrenches, rotary and pneumatic chipping hammers, drill presses, and bench grinders.		
11.02	Use and maintain light- and heavy-duty drills.		
11.03	Use and maintain electric hammers.		
11.04	Use and maintain pneumatic drills and hammers.		
11.05	Use and maintain power screwdrivers and nut runners.		
11.06	Use and maintain linear-motion saws.		
11.07	Use and maintain circular saws.		
11.08	Use and maintain belt, pad, and disc sanders.		
11.09	Use and maintain grinders and shears.		
12.0	Handle and apply lubricants--The student will be able to:		
12.01	Explain the functions of lubrication.		
12.02	Explain the properties of oil lubricants and the factors determining the selection of lubricants.		
12.03	Identify the types, advantages, and functions of lubricant additives.		
12.04	Explain the types of circulating oils and their purposes.		
12.05	Identify grease application.		
12.06	Identify lubricating systems and methods.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.07 Explain lubricant storage and handling methods.		
12.08 Explain the types of oil filters and their uses.		
12.09 Lubricate a piece of industrial equipment.		
12.10 Define the role of preventive maintenance in total equipment maintenance.		
12.11 Describe the major tasks of preventive maintenance: cleaning, inspection, lubrication, minor repair, and information feedback.		
12.12 Review a typical maintenance program.		
13.0 Perform benchwork skills--The student will be able to:		
13.01 Identify safety and shop rules.		
13.02 Cut materials by using hand hacksaws.		
13.03 Cut threads by using hand taps.		
13.04 Cut threads by using dies.		
13.05 Repair threads by chasing and thread inserts.		
13.06 Install dowel pins using tapered and straight reamers.		
13.07 Ream holes by using tapered and straight reamers.		
13.08 Hand-sharpen cutting tools by using abrasive stones.		
13.09 Hone and lap surfaces.		
13.10 Remove damaged screws and other hardware.		
13.11 Deburr workpieces.		
14.0 Perform gas and electric arc welding and cutting operations--The student will be able to:		
14.01 Identify the properties of the most commonly used metals and alloys, including hardness and malleability.		
14.02 Identify the processes and effects of tempering, annealing, and case hardening.		
14.03 Identify welding cylinders, regulators, hoses, pressure gauges, and torches.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.04 Describe welding-equipment safety procedures.		
14.05 Demonstrate proper flame settings.		
14.06 Demonstrate basic gas-welding skills.		
14.07 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.		
14.08 Demonstrate freehand and guide cutting of various metal thicknesses.		
14.09 Identify the uses of the following welding techniques: laser, ultrasonic, resistance, and percussion.		

Florida Department of Education
Student Performance Standards

Course Title: **Maintenance Skills 3**
Course Number: **8743230**
Course Credit: **1**

Course Description:

This course develops competencies in rigging and lifting, installing and removing machinery, conveyor maintenance, troubleshooting machinery performance, communicating, servicing customers, obtaining employment, and entrepreneurship skills in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Millwright.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
15.03	Integration of Knowledge and Ideas		
	15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity		
	15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Millwright.		
16.01	Text Types and Purposes		
	16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
16.02	Production and Distribution of Writing		
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Millwright.		

Florida Standards	Correlation to CTE Program Standard #
17.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.0 Perform rigging functions--The student will be able to:		
18.01 Demonstrate the safety procedures for performing rigging and lifting operations.		
18.02 Identify and inspect fiber and wire rope.		
18.03 Tie knots and hitches.		
18.04 Identify and use the components of rigging hardware.		
18.05 Perform rigging and lifting operations.		
18.06 Demonstrate the proper operation of a forklift.		
19.0 Install and remove machinery--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.01 Identify the safety procedures for installing and removing machinery.		
19.02 Identify the equipment required for machine installation and removal.		
19.03 Prepare an area for machine installation per the manufacturer's specifications.		
19.04 Rig, lift, and transport machinery to the installation site.		
19.05 Install electrical hookups to machinery.		
19.06 Install air hydraulic hookups to machinery.		
19.07 Perform an assigned machine retrofit per manufacturer's specifications.		
19.08 Perform an assigned machine removal and transport per specification requirements.		
19.09 Explain the importance of vibration detection.		
19.10 Identify the need for pipe supports to prevent pipe stress.		
20.0 Demonstrate conveyor-maintenance techniques--The student will be able to:		
20.01 Identify the types of conveyors.		
20.02 Identify the safety requirements and precautions for conveyor-maintenance operations.		
20.03 Adjust the tracking of a belt.		
20.04 Check a belt for wear.		
20.05 Identify the types of splices.		
20.06 Identify splicing equipment and procedures.		
20.07 Demonstrate conveyor-maintenance techniques, including making splices with splicing equipment.		
21.0 Identify common troubles and basic troubleshooting techniques--The student will be able to:		
21.01 Analyze the possible causes of common troubles in industrial-machinery performance.		
21.02 Identify basic troubleshooting techniques for bearings.		
21.03 Identify basic troubleshooting techniques for pumps.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.04 Identify basic troubleshooting techniques for drive systems.		
21.05 Identify basic troubleshooting techniques for electrical circuits.		
21.06 Identify basic troubleshooting techniques for hydraulics.		
21.07 Identify basic troubleshooting techniques for pneumatics.		
21.08 Identify basic troubleshooting techniques for PLCs.		

Florida Department of Education
Student Performance Standards

Course Title: **Machinery Maintenance 4**
Course Number: **8743240**
Course Credit: **1**

Course Description:

This course develops the competencies of planning an elementary predictive- preventive-maintenance schedule, performing gas and arc welding, performing machine-shop operations, maintaining piping and tubing systems, troubleshooting electrical circuits, and maintaining and installing drive components in the industrial-machinery maintenance-technology industry.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Millwright.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
15.03	Integration of Knowledge and Ideas		
	15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity		
	15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Millwright.		
16.01	Text Types and Purposes		
	16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
16.02	Production and Distribution of Writing		
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Millwright.		

Florida Standards	Correlation to CTE Program Standard #
17.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.0 Plan an elementary predictive - preventive - maintenance (PPM) schedule--The student will be able to:		
22.01 List the types of predictive-preventive maintenance.		
22.02 Describe the purpose of preventive-maintenance schedules.		
22.03 Create a preventive-maintenance schedule form using a machine manual or the manufacturer's recommendations.		
22.04 Identify troubles caused by the lack of preventive maintenance.		
22.05 Create a maintenance log and make entries for a machine or equipment.		
22.06 Create a preventive-maintenance schedule from a maintenance- failure log.		
23.0 Perform gas- and arc-welding procedures--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
23.01 Demonstrate the safety procedures for performing gas and arc welding and for transporting equipment.		
23.02 Identify the components of an oxyfuel rig.		
23.03 Set up and shut down an oxyfuel rig.		
23.04 Weld beads in a flat position.		
23.05 Weld an outside corner joint using a filler rod.		
23.06 Cut metal of various thicknesses'.		
23.07 Weld beads in a flat position using E-6010 and E-7018 electrodes.		
23.08 Weld beads in horizontal and in vertical positions using E-6010 and E-7018 electrodes.		
23.09 Weld beads in an overhead position using E-6010 and E-7018 electrodes.		
23.10 Weld beads using a MIG welder.		
23.11 Weld beads using a TIG welder.		
23.12 Solder and braze metals.		
23.13 Cut stainless steel and aluminum with a plasma-arc rig.		
24.0 Perform machine-shop operations--The student will be able to:		
24.01 Demonstrate safety in performing machine-shop operations.		
24.02 Identify the types of cutting tools.		
24.03 Bore a hole to a specified size.		
24.04 Chase an external V-thread.		
24.05 Identify the different types of work-holding devices.		
24.06 Prepare metal for finishing.		
24.07 Set up, use, and adjust an arbor press.		
24.08 Set up, use, and adjust a hydraulic press.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
24.09 Set up, use, and adjust broaching tools.		
24.10 Cut keyways with an end mill.		
25.0 Maintain piping and tubing systems--The student will be able to:		
25.01 Identify the components of a piping system.		
25.02 Explain the maintenance considerations of metallic and nonmetallic piping systems.		
25.03 Describe the safety requirements for working with piping and tubing systems.		
25.04 Join copper tubing.		
25.05 Join common fittings.		
25.06 Join metallic pipe.		
25.07 Join plastic pipe.		
25.08 Explain valve operation and maintenance.		
25.09 Explain the importance of strainers, filters, and traps in piping systems.		
25.10 Bend back-to-back, stub-ups, and doglegs in electrical metallic tubing (EMT).		
26.0 Troubleshoot electrical circuits--The student will be able to:		
26.01 Describe the safety requirements and precautions for troubleshooting electrical circuits.		
26.02 Disconnect and reconnect electric motors.		
26.03 Identify the parts and function of electrical control equipment.		
26.04 Define digital devices and PLC logic/ladder logic to troubleshoot.		
26.05 Identify the function of input and output devices and the controller.		
26.06 Explain how to troubleshoot a sequence of events.		
26.07 Use and maintain electrical test equipment for troubleshooting.		
27.0 Install and maintain drive components--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
27.01 Demonstrate safety procedures for installing and maintaining drive components.		
27.02 Identify types of bearings, their cross-referencing, and their uses.		
27.03 Remove, inspect, and/or replace bearings.		
27.04 Remove and replace seals.		
27.05 Perform shaft alignment.		
27.06 Identify the types of belts.		
27.07 Identify the types of chains.		
27.08 Perform tension adjustments and alignment on belt and chain drives.		
27.09 Troubleshoot belt and chain drives.		
27.10 Identify the types of gears.		
27.11 Remove, replace, and align gears, sprockets, and couplings.		
27.12 Remove, replace, or repair V-joints and jack shafts.		
27.13 Adjust gear backlash.		
27.14 Troubleshoot gear drives.		
27.15 Disassemble, inspect, reassemble, and adjust clutches.		
27.16 Identify the types of variable-speed drives.		
27.17 Troubleshoot variable-speed drives.		
27.18 Identify the types of cams and link mechanisms.		
27.19 Troubleshoot cam-and-link mechanism problems.		

Florida Department of Education
Student Performance Standards

Course Title: **Machinery Maintenance 5**
Course Number: **8743250**
Course Credit: **1**

Course Description:

This course develops the competencies of maintaining specific types of air compressors and maintaining, repairing, and troubleshooting fluid-drive systems in the industrial-machinery maintenance-technology industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
28.0	Maintain reciprocating, positive-displacement, and rotary air compressors--The student will be able to:		
28.01	Relate force, weight, mass, and density to a pneumatic system.		
28.02	Demonstrate safety procedures for maintaining reciprocating, positive-displacement, and rotary air compressors.		
28.03	Demonstrate the operation of reciprocating compressors.		
28.04	Demonstrate the operation of positive-displacement and rotary air compressors.		
28.05	Demonstrate primary and secondary air treatment.		
28.06	Demonstrate the operation of valves, cylinders, and motors.		
28.07	Check oil level.		
28.08	Change oil.		
28.09	Drain water from tank.		
28.10	Test for efficiency of compressor.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
28.11 Inspect storage tank for quality.		
28.12 Test pressure control switch.		
29.0 Maintain and repair hydraulic-system components--The student will be able to:		
29.01 Explain the safety procedures for installing hydraulic lines.		
29.02 Explain Pascal's law.		
29.03 Explain Bernoulli's principle.		
29.04 Explain how heat and pressure relate to power and transmission.		
29.05 Describe the physical and chemical properties of a fluid.		
29.06 Install and maintain a contaminant-removal system.		
29.07 Determine reservoir requirements.		
29.08 Classify and select pumps for specific applications.		
29.09 Compute hose requirements.		
29.10 Install hydraulic lines.		
29.11 Select and install control valves.		
30.0 Troubleshoot hydraulic systems--The student will be able to:		
30.01 Explain the safety procedures for troubleshooting hydraulic systems.		
30.02 Read a hydraulic schematic.		
30.03 Install hydraulic components.		
30.04 Connect electrically controlled valves.		
30.05 Explain hydraulic-system troubleshooting techniques.		
30.06 Repair and replace valves.		
30.07 Repair and replace cylinders.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
30.08 Repair and replace pumps and motors.		
31.0 Maintain and troubleshoot pneumatic systems--The student will be able to:		
31.01 Explain the safety procedures for troubleshooting pneumatic systems.		
31.02 Diagram an air-supply system.		
31.03 Install system components.		
31.04 Demonstrate system-maintenance techniques.		
31.05 Explain proper troubleshooting procedures.		
31.06 Troubleshoot air compressors.		
31.07 Troubleshoot, repair, and install control valves.		
31.08 Troubleshoot air motors.		
32.0 Maintain and troubleshoot fluid-drive systems--The student will be able to:		
32.01 Explain the safety procedures for maintaining and troubleshooting fluid-drive systems.		
32.02 Install adjustable speed drives.		
32.03 Troubleshoot adjustable speed drives.		
32.04 Explain the operation of fluid couplings.		
32.05 Install fluid couplings.		
32.06 Install torque converters.		
32.07 Perform preventive maintenance.		
32.08 Apply a "dynamic" magnetic/mechanical braking device to a motor.		
32.09 Mount the equipment.		
33.0 Maintain and troubleshoot robotic systems--The student will be able to:		
33.01 Identify uses of robotics in industry.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
33.02 Identify safety procedures related to robotic systems.		
33.03 Identify mechanical, hydraulic, pneumatic, and electric/electronic components of robotic systems.		
33.04 Perform routine maintenance and calibration of robotic systems.		
33.05 Remove, replace and adjust robotic system components.		

Florida Department of Education
Student Performance Standards

Course Title: **Machinery Maintenance 6**
Course Number: **8743260**
Course Credit: **1**

Course Description:

This course develops the competencies for pump maintenance and repair and for pollution control along with knowledge of industrial-pollution control systems in industrial-machinery maintenance-technology operations. It may include the development of optional competencies related to air-conditioning and refrigeration, boilers, and small engines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
34.0 Perform pump maintenance and repair--The student will be able to:		
34.01 Demonstrate the safety procedures for performing pump maintenance.		
34.02 Determine pump capacity and system requirements.		
34.03 Perform pump maintenance.		
34.04 Identify packing and seal requirements.		
34.05 Explain the operating principles of centrifugal, propeller and turbine rotary, reciprocating, diaphragm, positive placement, and vacuum pumps.		
34.06 Disassemble and reassemble a pump.		
35.0 Explain the operation of industrial-pollution control systems--The student will be able to:		
35.01 Explain the operation of air-pollution control systems.		
35.02 Explain the operation of water-pollution control systems.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
35.03 Explain the operation of solid-waste pollution control systems.		
35.04 Explain the operation of noise-pollution control systems.		
36.0 Troubleshoot air-conditioning and refrigeration systems--The student will be able to:		
36.01 Explain the principles of refrigeration.		
36.02 Identify the major components.		
36.03 Describe the functions of electrical systems.		
36.04 Troubleshoot air-conditioning and refrigeration systems.		
36.05 Explain the requirement for recovery of hazardous materials and related safety procedures.		
37.0 Identify boilers--The student will be able to:		
37.01 Identify the various types and components of heat exchangers.		
37.02 Identify the various types and components of boilers.		
37.03 Identify the various types and components of fractioning columns.		
37.04 Identify the uses of steam.		
38.0 Maintain internal combustion engines--The student will be able to:		
38.01 Explain the basic principles of operation of the two-stroke-cycle combustion engine.		
38.02 Identify the types of engines.		
38.03 Locate engine serial and model numbers.		
38.04 Identify engine assemblies and systems.		
38.05 Troubleshoot and evaluate engine performance.		
38.06 Perform routine maintenance on engine operating systems including air intake and exhaust, fuel, lubrication, starting and governing.		
38.07 Perform engine tune-up and adjustment procedures		
38.08 Remove and replace engine assemblies.		

Florida Department of Education
Student Performance Standards

Course Title: **Millwright 7**
Course Number: **8743270**
Course Credit: **1**

Course Description:

This course develops competencies in metal fabrication and precision layout for operations in the millwright industry. There is no occupational completion point associated with the completion of this course.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
39.0	Perform metal fabrication--The student will be able to:		
39.01	Field sketch equipment supports for applications in the millwright industry.		
39.02	Read and interpret requirements in OSHA 1910.211-219 and ANSI B15.1.		
39.03	Create, design, draw, fabricate, and paint an OSHA-approved guard.		
39.04	Use a Cut-A-Matic to make precision cuts.		
40.0	Perform precision layout--The student will be able to:		
40.01	Locate an existing benchmark and transfer it to various positions around a work area or site.		
40.02	Use the triangle procedure to check established benchmarks with an optical level and a transit.		
40.03	Identify and establish center lines of equipment related to building columns.		

Florida Department of Education
Student Performance Standards

Course Title: **Millwright 8**
Course Number: **8743280**
Course Credit: **1**

Course Description:

This course develops the competencies in advanced rigging operations in the millwright industry. There is no occupational completion point associated with the completion of this course.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
41.0 Perform advanced rigging--The student will be able to:		
41.01 Perform and interpret all rigging hand signals.		
41.02 Interpret and apply load charts for slings, chokers, and cables.		
41.03 Determine the weight of a load.		
41.04 Determine the method of lifting.		
41.05 Identify crane capacity, including the boom angle and load-swing radius.		
41.06 Identify and take the necessary precautions to accommodate weather conditions, load capacity, equipment, and safety factors.		
41.07 Balance different types of loads.		

Florida Department of Education
Student Performance Standards

Course Title: **Millwright 9**
Course Number: **8743290**
Course Credit: **1**

Course Description:

This course develops the competencies in installing, removing, and aligning machinery for operations in the millwright industry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
42.0	Install, remove, and align machinery--The student will be able to:		
42.01	Identify the equipment required for machine installation and removal in millwright applications.		
42.02	Operate levers, inclined planes, screws, wedges, wheel and axle assemblies, pulleys, and jacking screws.		
42.03	Perform site-clearance operations and demolition and salvage procedures.		
42.04	Explain the principles of machine alignment.		
42.05	Explain the principles of shaft alignment.		
42.06	Explain the relationship of structural problems to misalignment.		
42.07	Explain the use of thermal growth by calculation and field-growth techniques such as Essinger bars.		
42.08	Align machinery using wire line, transit, dial indicators, a computer, and laser-alignment devices.		
42.09	Perform laser horizontal and vertical alignment.		
42.10	Perform the train alignment of three or more machine and graph the results.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
42.11 Prepare an area for machine installation according to the manufacturer's specifications for selected applications.		
42.12 Position and secure machinery on a foundation.		
42.13 Level machinery and install balance-vibration dampers.		
42.14 Identify pipe-stress standards for millwright applications.		
42.15 Perform finish alignment and check for pipe stresses in millwright applications.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Millwright programs:

Millwright - I470313 (0647030302)
Millwright 1 - J590400 (0647030305)
Millwright 2 - J590500 (0647030306)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Jewelry Making and Repair**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8745500
CIP Number	0647040806
Grade Level	9-12, 30, 31
Standard Length	11 credits
Teacher Certification	METAL WORK 7G JWLY MFGR 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	49-9064 – Watch Repairers 51-9071 – Jewelers and Precious Stone and Metal Workers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment and/or specialized training in jewelry occupations.

The Jewelry Making and Repair program prepares students for employment as Clock, Watch and Jewelry Technician Assistants (SOC 49-9064), Jewelry Designers (SOC 51-9071.01), Wax Modeler/Casters (SOC 51-9071.03), Jewelry Repairers (SOC 51-9071.04), Stone Setters (SOC 51-9071.06) and Certified Jewelers/Gemologists (SOC 51-9071.00).

This program focuses on broad, transferable skills and stresses understanding and demonstration of the following elements of the Clock/Watch and Jewelry Repair industry; planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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 six occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8745501	Clock, Watch, Jewelry Making and Repair Core 1	1 credit		2
	8745502	Clock, Watch, Jewelry Making and Repair Core 2	1 credit		2
A	8745503	Clock, Watch, Jewelry Making and Repair Core 3	1 credit	49-9064	2
	8745504	Jewelry Making and Repair 4	1 credit		2
	8745505	Jewelry Making and Repair 5	1 credit		2
B	8745506	Jewelry Making and Repair 6	1 credit	51-9071	2
C	8745507	Jewelry Making and Repair 7	1 credit	51-9071	2
	8745508	Jewelry Making and Repair 8	1 credit		2
D	8745509	Jewelry Making and Repair 9	1 credit	51-9071	2
E	8745510	Jewelry Making and Repair 10	1 credit	51-9071	2
F	8745511	Jewelry Making and Repair 11	1 credit	51-9071	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Clock, Watch, Jewelry Making and Repair Core 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Clock, Watch, Jewelry Making and Repair Core 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Clock, Watch, Jewelry Making and Repair Core 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 10	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Jewelry Making and Repair 11	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Jewelry Making and Repair.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Jewelry Making and Repair.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.
04.0 Develop basic trade skills.
05.0 Demonstrate safe use of basic tools and equipment.
06.0 Perform sawing, piercing, filing and cutting skills.
07.0 Solder metals.
08.0 Perform general repairs.
09.0 Perform polishing techniques.
10.0 Perform shop management skills.
11.0 Identify timepieces.
12.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Jewelry Making and Repair.
13.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Jewelry Making and Repair.
14.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.
15.0 Demonstrate mathematics knowledge and skills.
16.0 Demonstrate science knowledge and skills.
17.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
18.0 Roll metal and wire.
19.0 Design and fabricate jewelry.
20.0 Cast jewelry.
21.0 Set stones.
22.0 Apply surface treatment.

Florida Department of Education
Student Performance Standards

Course Title: **Clock, Watch, Jewelry Making and Repair Core 1**
Course Number: **8745501**
Course Credit: **1**

Course Description:

This course introduces student to the basic activities and principles of assisting in the clock, watch and jewelry technician assistant trade.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Jewelry Making and Repair.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Jewelry Making and Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Develop basic trade skills--The student will be able to:		
04.01 Organize shop and maintain tools.		
04.02 Identify safety skills.		
04.03 Develop measuring and weighing skills.		
04.04 Test and identify metals.		
04.05 Identify problems with quartz watches.		
04.06 Select hand tools and equipment.		
05.0 Demonstrate safe use of basic tools and equipment--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.01 Handle tools and equipment safely.		
06.0 Perform sawing, piercing, filing and cutting skills--The student will be able to:		
06.01 Identify appropriate sawing, piercing, filing and cutting skills.		

Florida Department of Education
Student Performance Standards

Course Title: **Clock, Watch, Jewelry Making and Repair Core 2**
Course Number: **8745502**
Course Credit: **1**

Course Description:

This course allows students to develop the basic skills using jewelry making tools and equipment.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Jewelry Making and Repair.		
01.01	Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Jewelry Making and Repair.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.0 Solder metals--The student will be able to:		
07.01 Select soldering equipment and hand tools.		
07.02 Select appropriate solder and flux.		
07.03 Solder metals.		
08.0 Perform general repairs--The student will be able to:		
08.01 Identify watch batteries, gaskets, band, pins and round watch crystals.		
08.02 Identify jewelry findings and parts.		
08.03 Repair and replace finding.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.04 Repair basic chain links.		
09.0 Perform polishing techniques--The student will be able to:		
09.01 Buff metals using abrasives.		
09.02 Polish metals.		
09.03 Clean metals.		
09.04 Polish plastic crystals.		
10.0 Perform shop management skills--The student will be able to:		
10.01 Apply positive relations with employer or client.		
10.02 Identify and assess repairs.		
11.0 Identify timepieces--The student will be able to:		
11.01 Use standard references and computerized database to identify watch movements and replacement parts.		
11.02 Describe timepiece parts and their functions.		

Florida Department of Education
Student Performance Standards

Course Title: **Clock, Watch, Jewelry Making and Repair Core 3**
Course Number: **8745503**
Course Credit: **1**

Course Description:

This course allows students to develop the basic trade skills of jewelry sawing, piercing, filing and cutting. Students are also introduced to the necessary communications, math, and science skills and knowledge.

Florida Standards			Correlation to CTE Program Standard #
12.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Jewelry Making and Repair.		
	12.01 Key Ideas and Details		
	12.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	12.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	12.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	12.02 Craft and Structure		
	12.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	12.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	12.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
12.03	Integration of Knowledge and Ideas		
	12.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	12.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	12.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
12.04	Range of Reading and Level of Text Complexity		
	12.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	12.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
13.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Jewelry Making and Repair.		
13.01	Text Types and Purposes		
	13.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	13.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	13.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
13.02	Production and Distribution of Writing		
	13.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	13.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	13.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
13.03	Research to Build and Present Knowledge		
	13.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	13.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	13.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
13.04	Range of Writing		
	13.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
14.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.		

Florida Standards	Correlation to CTE Program Standard #
14.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
14.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
14.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
14.04 Model with mathematics. MAFS.K12.MP.4.1	
14.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
14.06 Attend to precision. MAFS.K12.MP.6.1	
14.07 Look for and make use of structure. MAFS.K12.MP.7.1	
14.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Demonstrate mathematics knowledge and skills--The students will be able to:		
15.01 Demonstrate knowledge of arithmetic operations.		
15.02 Analyze and apply data and measurements to solve problems and interpret documents.		
15.03 Construct charts/tables/graphs using functions and data.		
16.0 Demonstrate science knowledge and skills--The students will be able to:		
16.01 Discuss the role of creativity in constructing scientific questions, methods and explanations.		
16.02 Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.0	Use oral and written communication skills in creating, expressing and interpreting information and ideas--The students will be able to:		
17.01	Select and employ appropriate communication concepts and strategies to enhance oral and written communication in the workplace.		
17.02	Locate, organize and reference written information from various sources.		
17.03	Design, develop and deliver formal and informal presentations using appropriate media to engage and inform diverse audiences.		
17.04	Interpret verbal and nonverbal cues/behaviors that enhance communication.		
17.05	Apply active listening skills to obtain and clarify information.		
17.06	Develop and interpret tables and charts to support written and oral communications.		
17.07	Exhibit public relations skills that aid in achieving customer satisfaction.		
17.08	Project a professional image.		
17.09	Work individually and cooperatively as a member of regular or cultural diverse team.		
17.10	Utilize communication skills applicable to the industry.		
17.11	Balance personal and professional life.		
17.12	Use and conserve resources and energy.		
17.13	Locate and select employment opportunities.		
17.14	Demonstrate employment seeking skills.		
17.15	Use and conserve resources and energy.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 4**
Course Number: **8745504**
Course Credit: **1**

Course Description:

This course trains students in the use of various tools and equipment necessary to solder metals and design and construct jewelry.

Florida Standards			Correlation to CTE Program Standard #
12.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Jewelry Making and Repair.		
	12.01 Key Ideas and Details		
	12.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	12.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	12.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	12.02 Craft and Structure		
	12.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	12.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	12.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
12.03	Integration of Knowledge and Ideas		
	12.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	12.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	12.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
12.04	Range of Reading and Level of Text Complexity		
	12.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	12.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
13.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Jewelry Making and Repair.		
13.01	Text Types and Purposes		
	13.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	13.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	13.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
13.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	13.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	13.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	13.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
13.03	Research to Build and Present Knowledge		
	13.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	13.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	13.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
13.04	Range of Writing		
	13.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
14.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Jewelry Making and Repair.		
14.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
14.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
14.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
14.04 Model with mathematics. MAFS.K12.MP.4.1	
14.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
14.06 Attend to precision. MAFS.K12.MP.6.1	
14.07 Look for and make use of structure. MAFS.K12.MP.7.1	
14.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.0 Demonstrate safe use of basic tools and equipment--The student will be able to:		
05.02 Operate polishing machine.		
05.03 Operate ultrasonic cleaning machine.		
06.0 Perform sawing, piercing, filing and cutting skills--The student will be able to:		
06.02 Use sawing techniques.		
06.03 Use piercing techniques.		
06.04 Use filing techniques.		
06.05 Use cutting techniques.		
07.0 Solder metals--The student will be able to:		
07.04 Solder jewelry.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 5**
Course Number: **8745505**
Course Credit: **1**

Course Description:

This course trains students in the use of various tools and equipment necessary to solder metals and design and construct jewelry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Perform shop management skills--The student will be able to:		
10.03 Prepare cost estimates and work orders.		
10.04 Maintain a shop production schedule.		
10.05 Maintain inventory.		
10.06 Explain impact of professional trade organizations on the industry.		
18.0 Roll metal and wire--The student will be able to:		
18.01 Melt precious metals into ingots.		
18.02 Roll ingot into sheet metal wire.		
18.03 Construct a tubing wire.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 6**
Course Number: **8745506**
Course Credit: **1**

Course Description:

This course trains students in the use of various tools and equipment necessary to solder metals and design and construct jewelry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Design and fabricate jewelry--The student will be able to:		
19.01 Design and fabricate jewelry using wire.		
19.02 Design and fabricate jewelry using sheet metals.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 7**
Course Number: **8745507**
Course Credit: **1**

Course Description:

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.0 Cast jewelry--The student will be able to:		
20.01 Identify types of casting methods.		
20.02 Design and sculpture wax models and molds.		
20.03 Cast jewelry pieces using lost wax process.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 8**
Course Number: **8745508**
Course Credit: **1**

Course Description:

This course trains students in the repair and rebuilding of jewelry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Perform general repairs--The student will be able to:		
08.05 Analyze and perform advanced chain link repair.		
08.06 Size ring.		
08.07 Reshank ring.		
08.08 Replace watch battery		
08.09 Replace findings		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 9**
Course Number: **8745509**
Course Credit: **1**

Course Description:

This course trains students in the repair and rebuilding of jewelry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.0 Perform general repairs--The student will be able to:		
08.10 Repair prong.		
08.11 Repair hinge.		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 10**
Course Number: **8745510**
Course Credit: **1**

Course Description:

This course trains students to identify, test and set gemstones.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Set stones--The student will be able to:		
21.01 Test and identify stones.		
21.02 Set stone in a pronged mounting.		
21.03 Set stone in a bezel setting.		
21.04 Set stone in a baguette setting.		
21.05 Set stone in a pave setting.		
21.06 Set stone in a peg setting.		
21.07 Set stone in a tube setting.		
21.08 Set stone in a channel setting.		
21.09 Restring pearls and stone beads		

Florida Department of Education
Student Performance Standards

Course Title: **Jewelry Making and Repair 11**
Course Number: **8745511**
Course Credit: **1**

Course Description:

This course trains students in jewelry business ethics, to cut gemstones and to apply various surface treatments to jewelry.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.0 Apply surface treatment--The student will be able to:		
22.01 Identify surface techniques.		
22.02 Electroplate jewelry.		
22.03 Perform diamond cutting.		
22.04 Apply enamel to metal.		
22.05 Apply repousse' and chasing techniques.		
22.06 Apply engraving techniques.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Jewelry Making and Repair programs:

Jewelry Making and Repair - I480602 (0647040806)
Jewelry Making and Repair 1 - J450400 (0647040804)
Jewelry Making and Repair 2 - J450500 (0647040805)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Suggested Equipment/Tool List
For Certified Watchmaker

This list is adopted from the American Watchmakers-Clockmakers Institute (AWCI) as required for the AWCI Certified Watchmaker Exam. Cleaning machines and solutions should be provided by the school. The brand names mentioned below are used to help identify the tools from the most popular tool catalogs; a student is welcome to choose a brand of his/her choice, as long as it is of comparable or better quality. When more than one type of tool is listed below - this indicates that a student may bring the tool of his/her preference.

R1: Required
R2: Recommended
O: Optional

Description	Bergeon	Other Brands	R1	R2	O
1. Arkansas slip (triangular or square) 85mm x 7mm (approx.)				**X**	
2. Barrel Arbor Holder (slide locking jaws) [a.k.a. sliding pin vise]	30610 Diam. 1.50			**X**	
3. Barrel Arbor Holder (slide locking jaws) [a.k.a. sliding pin vise]	30610 Diam. 1.00			**X**	
4. Barrel closing tool (Cas-Ker)				**X**	
5. Baskets small round, 5 or more (i.e. for L&R cleaning machines)					**X**
6. Basket, small round with screw-on cover for small parts e.g. cap jewels			**X**		
7. Benzene glass jar (small) 60mm (or smaller)				**X**	
8. Bench Block (anvil)				**X**	
9. Broaches (pivot-cutting, hand broaches 0.05mm - 0.20mm)	3008-A		**X**		
10. Brush (small & soft)	1300-6			**X**	
11. Brush, 3 rows, No. 4	1103-4			**X**	
12. Carbide gravers (if not available you may purchase blanks as below)				**X**	
13. Carbide graver blank (1/16” thick or 1.58mm) www.mscdirect.com		04120077	**X**		
14. Casing cushion	5394			**X**	
15. Clear Plexiglas round stick 4mm thick, 6” long (from arts and crafts stores)	-				**X**
16. Cloth (lint-free, e.g. microfiber)				**X**	
17. Dial plastic protection	6938				**X**
18. Dust-lower (rubber)		A.F.18666	**X**		
19. Epilame, (oil repellant)					**X**
20. Escapement meter					**X**
21. ETACHRON regulator adjusting tool		015595			**X**

Description	Bergeon	Other Brands	R1	R2	O
22. ETACHRON stud removing tool		015600			**X**
23. File, rectangular, 150mm(L) x 18.5mm(W) x 4.0mm(T)	500-1163-6			**X**	
24. Hammer (Brass or Brass & Fiber)	30416		**X**		
25. Hands fitting tool/pusher	7404			**X**	
26. Hands press e.g. Horotec or Bergeon (with assorted nylon pushers)					**X**
27. Holder for pallet-fork	30433				**X**
28. Jewelling tool		Horia/Seitz			**X**
29. Knife with case opener	6403		**X**		
30. Leather/Chamois buff 6mm wide (x1)	1282-D				**X**
31. Levers for hairspring collets, 1.7mm			**X**		
32. Levers for hands					**X**
33. Loupe (watchmaker's) 10X	4902-1	Bausch & Lomb	**X**		
34. Loupe (watchmaker's) 3X or 4X	4902-2.5	Bausch & Lomb	**X**		
35. Lubricants may be provided by the school or students may bring their own			**-**	**-**	**-**
36. Lubricant, Moebuis Synth-A-Lube #9010		9010			**X**
37. Lubricant, Moebuis Visco-Lube #9020		9020			**X**
38. Lubricant, Moebuis Pallet fork grease #9415		9415			**X**
39. Lubricant, Microglisse D5		D5			**X**
40. Lubricant, Molykote					**X**
41. Lubricant, Moebius HP1300					**X**
42. Lubricant, P125 Chronogrease					**X**
43. Micrometer (accuracy to within 0.005mm)				**X**	
44. Oilers (plastic handle e.g. Bergeon,) assortment black, red			**X**		
45. Oiler (automatic No. 1A)					**X**
46. Opener (for snap back cases) e.g. Seiko S-282 & S-283 or similar					**X**
47. Pegwood, 3mm	6724-30		**X**		
48. Pegwood, 4mm	6724-40				**X**
49. Pith wood			**X**		
50. Pin vise, double-ended (0 - 3.2mm capacity)(stem holding capacity)	5860	58.240	**X**		

Description	Bergeon	Other Brands	R1	R2	O
51. Pivot drill, 0.25mm to cut balance during poising			**X**		
52. Pliers, assortment of 3	2513				**X**
53. Poising Tool					**X**
54. Presto for removing hands, tool #1 (polish the outer jaw surfaces to a mirror sheen)	30636-1			**X**	
55. Presto for chrono fourth wheel tool #3 (polish the jaw surfaces to a mirror sheen)	30636-3		**X**		
56. Rodico or Rub-off				**X**	
57. Roller table remover (polish the jaw surfaces to a smooth mirror sheen)	2810		**X**		
58. Screwdrivers (watchmakers)			**X**		
59. Stem cutter (end-cutting pliers)			**X**		
60. Tray (with Plexiglas bell) (or any similar tray with clear cover)	3508		**X**		
61. Truing calipers (Levin or “lyre” style)	30548			**X**	
62. Truing caliper					**X**
63. Tweezers, brass AM	1064-AM		**X**		
64. Tweezers, antimagnetic, No. 00 (for cap jewels)				**X**	
65. Tweezers, antimagnetic, No. 5	6671-5		**X**		
66. Tweezers, antimagnetic, No. 3	6671-3		**X**		
67. Tweezers for hands, Teflon coated, or Delrin tipped [thinnest tip]		Fontax/Other		**X**	
68. Watch paper				**X**	
69. Vernier caliper (metric & imperial, or digital)	-				**X**
70. Sealing plastic bags 2” x 2” (clear) approx. 10			**X**		

Tool list updated 3/27/2007 by AWCI.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Boat and Yacht Repair/Refinishing Technology**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8751300
CIP Number	0647061601
Grade Level	9-12, 30, 31
Standard Length	9 credits
Teacher Certification	SEAMANSHIP 7G CARPENTRY @7 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	51-2091 – Fiberglass Laminators and Fabricators 47-3019 – Helpers, Construction Trades, All Other
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in boat and yacht repair and refinishing positions.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices as marine painter/refinisher, marine carpenter, marine mechanical systems technician or marine welder/fabricator. A program may be structured to emphasize one of the course areas but does not have to cover all areas comprehensively.

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 three occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8751310	Boat and Yacht Repair/Refinishing Technology 1	1 credit		2
A	8751320	Boat and Yacht Repair/Refinishing Technology 2	1 credit	47-3019	2
	8751330	Boat and Yacht Repair/Refinishing Technology 3	1 credit		2
	8751340	Boat and Yacht Repair/Refinishing Technology 4	1 credit		2
B	8751350	Boat and Yacht Repair/Refinishing Technology 5	1 credit	51-2091	2
	8751360	Boat and Yacht Repair/Refinishing Technology 6	1 credit		2
	8751370	Boat and Yacht Repair/Refinishing Technology 7	1 credit		2
	8751380	Boat and Yacht Repair/Refinishing Technology 8	1 credit		2
C	8751390	Boat and Yacht Repair/Refinishing Technology 9	1 credit	51-2091	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Boat and Yacht Repair/Refinishing Technology 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Technology 3												
Boat and Yacht Repair/Refinishing Technology 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Boat and Yacht Repair/Refinishing Technology 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
04.0 Describe different types of marine manufacturing industries.
05.0 Demonstrate basic skills in the different types of marine trades and occupations.
06.0 Demonstrate proficiency in preparing surfaces and applying marine paint finishes.
07.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
08.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
09.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.
10.0 Demonstrate proficiency in preparing surfaces and refinishing fiberglass.
11.0 Demonstrate proficiency in marine terminology.
12.0 Demonstrate proficiency in safety practices in marine occupations.
13.0 Demonstrate the ability to properly handle lines and related operations in securing a vessel.
14.0 Demonstrate proficiency in coordinating the manufacturing, repair and refinishing operations in the marine industry.
15.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
16.0 Explain the importance of employability and entrepreneurship skills.
17.0 Demonstrate personal money-management concepts, procedures, and strategies.

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 1**
Course Number: **8751310**
Course Credit: **1**

Course Description:

This course develops competencies in recognizing the different types of marine manufacturing industries and the occupations related to each.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Describe different types of marine manufacturing industries--The student will be able to:		
04.01 Explain the process of manufacturing motor yachts.		
04.02 Explain the process of manufacturing sailboats.		
04.03 Explain the process of manufacturing small powerboats.		
04.04 Explain the process of manufacturing center console boats.		
04.05 Explain the process of manufacturing of commercial workboats.		
05.0 Demonstrate basic skills in the different types of marine trades and occupations--The student will be able to:		
05.01 Describe the occupational requirements of a boat finisher/painter.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.02 Perform basic occupational requirements of a marine carpenter.		
05.03 Perform basic occupational requirements of a marine mechanical installer.		
05.04 Perform basic occupational requirements of a marine welder fabricator.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 2**
Course Number: **8751320**
Course Credit: **1**

Course Description:

This course develops competencies in preparing surfaces for marine finishes as well as related science and employability skills.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
01.01	Key Ideas and Details		
01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1		
01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2		
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3		
01.02	Craft and Structure		
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4		
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5		

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.0 Demonstrate proficiency in preparing surfaces and applying marine paint finishes--The student will be able to:		
06.01 Prepare wood surfaces for painting.		
06.02 Prepare aluminum surfaces for painting.		
06.03 Prepare steel surfaces for painting.		
06.04 Apply paint to surfaces by brush.		
06.05 Apply paint to surfaces by spray gun.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 3**
Course Number: **8751330**
Course Credit: **1**

Course Description:

This course develops competencies in preparing fiberglass surfaces for marine finishes.

Florida Standards			Correlation to CTE Program Standard #
07.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
07.01	Key Ideas and Details		
07.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
07.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
07.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
07.02	Craft and Structure		
07.02.1		Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
07.02.2		Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
07.02.3		Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
07.03	Integration of Knowledge and Ideas		
	07.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	07.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	07.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
07.04	Range of Reading and Level of Text Complexity		
	07.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	07.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
08.01	Text Types and Purposes		
	08.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	08.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	08.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
08.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	08.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	08.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	08.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
08.03	Research to Build and Present Knowledge		
	08.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	08.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	08.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
08.04	Range of Writing		
	08.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
09.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		
09.02	Reason abstractly and quantitatively. MAFS.K12.MP.2.1		

Florida Standards	Correlation to CTE Program Standard #
09.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
09.04 Model with mathematics. MAFS.K12.MP.4.1	
09.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
09.06 Attend to precision. MAFS.K12.MP.6.1	
09.07 Look for and make use of structure. MAFS.K12.MP.7.1	
09.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Demonstrate proficiency in preparing surfaces and refinishing fiberglass--The student will be able to:		
10.01 Prepare raw fiberglass surfaces for painting.		
10.02 Repair and refinish fiberglass surfaces.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 4**
Course Number: **8751340**
Course Credit: **1**

Course Description:

This course develops competencies in marine terminology and safety practices.

Florida Standards			Correlation to CTE Program Standard #
07.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
07.01	Key Ideas and Details		
07.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
07.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
07.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
07.02	Craft and Structure		
07.02.1		Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
07.02.2		Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
07.02.3		Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
	07.03	Integration of Knowledge and Ideas	
	07.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	07.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	07.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
	07.04	Range of Reading and Level of Text Complexity	
	07.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	07.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
	08.01	Text Types and Purposes	
	08.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	08.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	08.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
	08.02	Production and Distribution of Writing	

Florida Standards			Correlation to CTE Program Standard #
	08.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	08.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	08.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
08.03	Research to Build and Present Knowledge		
	08.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	08.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	08.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
08.04	Range of Writing		
	08.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Boat and Yacht Repair/Refinishing Technology.		
09.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
09.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
09.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
09.04 Model with mathematics. MAFS.K12.MP.4.1	
09.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
09.06 Attend to precision. MAFS.K12.MP.6.1	
09.07 Look for and make use of structure. MAFS.K12.MP.7.1	
09.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
11.0 Demonstrate proficiency in marine terminology--The student will be able to:		
11.02 Use correct marine terminology.		
11.03 Use correct marine technical terminology.		
12.0 Demonstrate proficiency in safety practices in marine occupations--The student will be able to:		
12.02 Demonstrate the safe use of hand tools in marine occupations.		
12.03 Demonstrate the safe use of power tools in marine occupations.		
12.04 Demonstrate the safe use of paints, chemicals, fiberglass and compounds.		
12.05 Demonstrate the safe use of electrical connectors, cords and tools.		
12.06 Apply shop safety rules.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 5**
Course Number: **8751350**
Course Credit: **1**

Course Description:

This course develops competencies in properly securing a vessel.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
13.0	Demonstrate the ability to properly handle lines and related operations in securing a vessel-- The student will be able to:		
13.01	Demonstrate the use of, a minimum of eight (8), correct nautical knots used in securing a vessel.		
13.02	Identify the current terminology of lines.		
13.03	Demonstrate slowing a vessel in dock.		
13.04	Place fenderboards to protect a vessel		
13.05	Connect ancillary services to a moored vessel.		
13.06	Demonstrate blocking and supporting a vessel for repair in a work yard.		
13.07	Demonstrate two common methods of splicing.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 6**
Course Number: **8751360**
Course Credit: **1**

Course Description:

This course develops competencies in properly coordinating a work process.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Demonstrate proficiency in coordinating the manufacturing, repair and refinishing operations in the marine industry--The student will be able to:		
14.01	Perform different basic types of work processes.		
14.02	Identify the sequential order of work processes.		
14.03	Demonstrate the ability to coordinate the work processes in the boatyard manufacturing or refurbishing environment.		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 7**
Course Number: **8751370**
Course Credit: **1**

Course Description:

This course develops competencies in basic and appropriate communication skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
15.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives--The students will be able to:		
15.01	Employ leadership skills to accomplish organizational goals and objectives. LT1.0		
15.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks. LT3.0		
15.03	Conduct and participate in meetings to accomplish work tasks. LT4.0		
15.04	Employ mentoring skills to inspire and teach others. LT5.0		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 8**
Course Number: **8751380**
Course Credit: **1**

Course Description:

This course develops competencies in appropriate math, skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
16.0	Explain the importance of employability and entrepreneurship skills--The students will be able to:		
16.01	Identify and demonstrate positive work behaviors needed to be employable. ECD1.0		
16.02	Develop personal career plan that includes goals, objectives, and strategies. ECD2.0		
16.03	Examine licensing, certification, and industry credentialing requirements. ECD3.0		
16.04	Maintain a career portfolio to document knowledge, skills, and experience. ECD5.0		
16.05	Evaluate and compare employment opportunities that match career goals. ECD6.0		
16.06	Identify and exhibit traits for retaining employment. ECD7.0		
16.07	Identify opportunities and research requirements for career advancement. ECD8.0		
16.08	Research the benefits of ongoing professional development. ECD9.0		
16.09	Examine and describe entrepreneurship opportunities as a career planning option. ECD10.0		

Florida Department of Education
Student Performance Standards

Course Title: **Boat and Yacht Repair/Refinishing Technology 9**
Course Number: **8751390**
Course Credit: **1**

Course Description:

This course develops competencies in money-management concepts, procedures and strategies.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
17.0	Demonstrate personal money-management concepts, procedures, and strategies--The students will be able to:		
17.01	Identify and describe the services and legal responsibilities of financial institutions. FL2.0		
17.02	Describe the effect of money management on personal and career goals. FL3.0		
17.03	Develop a personal budget and financial goals. FL3.1		
17.04	Complete financial instruments for making deposits and withdrawals. FL3.2		
17.05	Maintain financial records. FL3.3		
17.06	Read and reconcile financial statements. FL3.4		
17.07	Research, compare and contrast investment opportunities.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Boat and Yacht Repair/Refinishing Technology programs:

Boat and Yacht Repair/Refinishing Technology - I490316 (0647061601)
Boat and Yacht Repair/Refinishing Technology 1 - J430100 (0647061603)
Boat and Yacht Repair/Refinishing Technology 2 - J430200 (0647061604)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Machining**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8754000
CIP Number	0648050302
Grade Level	9-12, 30, 31
Standard Length	10 credits
Teacher Certification	MACH SHOP @7 7G METAL WORK 7G TOOL DIE 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	51-4035 – Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic 51-4041 – Machinists
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in machining positions.

The content includes but is not limited to broad, transferable skills, stresses the understanding of all aspects of the machining industry, and demonstrates such elements of the industry as planning, management, finance, technical and production skills, underlying principles of technology, labor issues, community issues, and health, safety, and environmental issues.

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 four occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8754010	Machining 1	1 credit		2
A	8754020	Machining 2	1 credit	51-4041	2
	8754030	Machining 3	1 credit		2
	8754040	Machining 4	1 credit		3
B	8754050	Machining 5	1 credit	51-4035	3
	8754060	Machining 6	1 credit		3
	8754070	Machining 7	1 credit		3
C	8754080	Machining 8	1 credit	51-4041	3
	8754090	Machining 9	1 credit		3
D	8754091	Machining 10	1 credit	51-4041	3

Academic Alignment Table

Some or all of the courses in this program have been academically aligned to the Florida Standards for Mathematics and the Next Generation Sunshine State Standards (NGSSS) for Science. The table below contains the results of the alignment efforts by both academic core and Career and Technical Education (CTE) professional educators. Data shown in the table includes the number of academic standards in the CTE course and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Machining 1	^^	^^	^^	#	#	#	#	#	#	#	1/56 2%	1/53 2%
Machining 2	^^	^^	^^	1/53 2%	5/52 10%	3/56 5%	4/55 7%	3/58 5%	1/35 3%	5/42 12%	6/56 11%	3/53 6%
Machining 3	^^	^^	^^	1/53 2%	4/52 8%	2/56 4%	4/55 7%	3/58 5%	1/35 3%	4/42 10%	4/56 7%	3/53 6%
Machining 4	^^	^^	^^	#	#	#	#	#	#	#	#	#

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Machining 5	^^	^^	^^	#	#	#	#	#	#	#	#	#
Machining 6	^^	^^	^^	#	#	#	#	#	#	#	#	#
Machining 7	^^	^^	^^	#	#	#	#	#	#	#	#	#
Machining 8	^^	^^	^^	#	#	#	#	#	#	#	4/56 7%	5/53 9%
Machining 9	^^	^^	^^	#	#	#	#	#	#	#	#	#
Machining 10	^^	^^	^^	#	#	#	#	#	#	#	#	#

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

National Standards

Programs identified as having Industry or National Standards have been crosswalked with the corresponding standards and/or benchmarks. Industry or National Standards for the Machining program can be found using the following link:

https://www.nims-skills.org/web/nims/home

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Machining.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Machining.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Machining.
04.0 Maintain a work area.
05.0 Solve basic job-related math problems.
06.0 Interpret basic blueprint information.
07.0 Plan machining operations.
08.0 Perform basic measuring operations.
09.0 Maintain machines and tools.
10.0 Perform benchwork skills.
11.0 Set up and operate power saws.
12.0 Set up and operate pedestal grinders.
13.0 Set up and operate drill presses.
14.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas.
15.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Machining.
16.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Machining.
17.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Machining.
18.0 Apply blueprint specifications to production.
19.0 Perform basic precision-measuring operations.
20.0 Sharpen machining tools.
21.0 Operate lathes.
22.0 Operate milling machines.
23.0 Operate grinding machines.
24.0 Solve problems using critical thinking skills, creativity and innovation.
25.0 Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance.
26.0 Solve advanced job-related math problems.
27.0 Interpret blueprints and machine operations.
28.0 Demonstrate inspection methods.
29.0 Operate a computerized-numerical-control (CNC) machine.
30.0 Operate and set up electrical discharge machine (EDM).
31.0 Use information technology tools.
32.0 Set up and operate a computerized-numerical-control (CNC) machine.
33.0 Use computer-aided design/computer-aided manufacturing (CAD/CAM).
34.0 Perform advanced lathe operations.

35.0 Perform advanced milling operations.
36.0 Perform advanced grinding operations.
37.0 Set up and operate heat-treating furnaces. (optional)
38.0 Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives.
39.0 Explain the importance of employability and entrepreneurship skills.

Florida Department of Education
Student Performance Standards

Course Title: **Machining 1**
Course Number: **8754010**
Course Credit: **1**

Course Description:

This course develops introductory skills necessary in machining operations

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Machining.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Machining.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Machining.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Maintain a work area--The student will be able to:			
04.01 Dispose of scrap-metal chips, shavings, trash, and waste.			
04.02 Maintain a shop area in a clean, orderly, and safe condition.			
04.03 Comply with shop-safety rules and practices.			
04.04 Comply with shop-operating guidelines.			
04.05 Follow the guidelines on material-safety data sheets, including proper handling of hazardous waste and chemicals.			
05.0 Solve basic job-related math problems--The student will be able to:		SC.912.L.17.16	
05.01 Solve job-related problems by adding, subtracting, multiplying, and dividing whole numbers, decimals, and common fractions.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
05.02	Measure a workpiece and compare measurements with blueprint specifications, including tolerances.			
05.03	Calculate the amount of material that should be removed to obtain correct limits for secondary operations.			
05.04	Solve job-related problems using mathematical handbooks, charts, and tables.			
05.05	Calculate machine speed and feed by using appropriate formulas.			
05.06	Calculate chip load per tooth on milling machines.			
06.0	Interpret basic blueprint information--The student will be able to:			
06.01	Interpret view concepts.			
06.02	Interpret lines.			
06.03	Read and interpret title blocks.			
06.04	Read and interpret change orders on working and assembly prints.			
06.05	Read and interpret abbreviations.			
07.0	Plan machining operations--The student will be able to:			
07.01	Comply with safe and efficient work practices.			
07.02	Perform layout for precision machine work by using layout instruments.			
07.03	Describe the importance of quality assurance.			
08.0	Perform basic measuring operations--The student will be able to:			
08.01	Comply with safe and efficient work practices.			
08.02	Read and measure with rules and calipers.			
08.03	Read and measure with micrometers.			
08.04	Read and measure with vernier tools.			
08.05	Use surface-plate techniques.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
09.0 Maintain machines and tools--The student will be able to:		SC.912.P.8.1	
09.01 Comply with safe and efficient work practices.			
09.02 Lubricate equipment parts.			
09.03 Clean and store hand tools, cutters, fixtures, jigs, and attachments.			
09.04 Inspect and repair hand tools.			
09.05 Inspect drive pulleys or belts.			
09.06 Select lubricants for machining operations.			
09.07 Inspect equipment for safe operational conditions.			
09.08 Store grinding wheels.			
09.09 Store precision tools.			
09.10 Inspect and adjust machine guards.			
09.11 Inspect work areas to assure a safe working environment.			
09.12 Inspect and maintain machine cutting fluids.			
10.0 Perform benchwork skills--The student will be able to:			
10.01 Comply with safe and efficient work practices.			
10.02 Cut materials by using hand hacksaws. (optional)			
10.03 Cut threads by using hand taps.			
10.04 Cut threads by using dies.			
10.05 Deburr workpieces.			
10.06 Demonstrates filing techniques.(optional)			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 2**
Course Number: **8754020**
Course Credit: **1**

Course Description:

This course develops competencies in setting up and operating equipment and tools related to the machining industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Machining.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Machining.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Machining.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
11.0 Set up and operate power saws--The student will be able to:		SC.912.N.1.1, 4, 7	
11.01 Comply with safe and efficient work practices.			
11.02 Remove and replace saw blades.			
11.03 Select appropriate blades to perform given sawing operations.			
11.04 Select and set speeds and feeds for given sawing operations.			
11.05 Measure and cut material using a power saw.			
11.06 Saw to scribed lines by using a metal band saw.			
11.07 Cut and weld band-saw blades for contour sawing.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
11.08 Set up and operate saws for angular cutting.			
12.0 Set up and operate pedestal grinders--The student will be able to:		SC.912.N.3.1	
12.01 Comply with safe and efficient work practices.			
12.02 Identify the parts of the machine and explain their uses.			
12.03 Set up support rests.			
12.04 Dress grinding wheels.			
13.0 Set up and operate drill presses--The student will be able to:		SC.912.N.4.1	
13.01 Identify the parts of a drill press and explain their uses.			
13.02 Identify and set the machine controls.			
13.03 Comply with safe and efficient work practices.			
13.04 Select the proper tooling.			
13.05 Set up and operate a drill press for hole work, center drill, drill, ream, countersink, and counterbore.			
13.06 Set drill presses for proper feed and speed for specified operations.			
14.0 Use oral and written communication skills in creating, expressing and interpreting information and ideas--The students will be able to:			
14.01 Locate, organize and reference written information from various sources.			
14.02 Develop and interpret tables and charts to support written and oral communications.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 3**
Course Number: **8754030**
Course Credit: **1**

Course Description:

This course develops competencies in the basic skills required in the machining industry.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Machining.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
15.03	Integration of Knowledge and Ideas		
	15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity		
	15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Machining.		
16.01	Text Types and Purposes		
	16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
16.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Machining.		
17.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
18.0 Apply blueprint specifications to production--The student will be able to:		SC.912.N.1.1, 4, 7	
18.01 Create shop sketches.			
18.02 Identify the costs involved in product production.			
19.0 Perform basic precision-measuring operations--The student will be able to:		SC.912.N.4.1	
19.01 Comply with safe and efficient work practices.			
19.02 Read and measure with dial indicators.			
19.03 Read and measure with gage blocks and adjustable gages.			
19.04 Take readings using optical comparators.			
20.0 Sharpen machining tools--The student will be able to:			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
20.01 Comply with safe and efficient work practices.			
20.02 Hand sharpen cutting tools by using abrasive stones.			
20.03 Grind lathe tools to required angles.			
20.04 Sharpen drills.			
21.0 Operate lathes--The student will be able to:			
21.01 Identify the parts of a lathe and explain their uses.			
21.02 Comply with safe and efficient work practices.			
21.03 Set up an engine lathe.			
21.04 Secure tools, tool holders, and fixtures or attachments.			
21.05 Select and set feeds and speeds.			
21.06 Set up lathes and face workpieces held in chucks.			
21.07 Rough cut and finish cut with lathes.			
21.08 Perform lathe filing to deburr parts.			
21.09 Drill holes with lathes.			
21.10 Countersink holes with lathes.			
21.11 Ream holes with lathes.			
21.12 Tap threads with lathes.			
21.13 Die cut threads with lathes.			
21.14 Counterbore holes with lathes.			
21.15 Align lathe centers using accurate methods.			
21.16 Bore holes with lathes.			
21.17 Knurl parts with lathes.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
21.18 Cut external threads with lathes.			
21.19 Perform contour, angular, or radii cuts with lathes.			
21.20 Set up the face plate and dog.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 4**
Course Number: **8754040**
Course Credit: **1**

Course Description:

This course develops competencies required to operate milling machines.

Florida Standards			Correlation to CTE Program Standard #
15.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Machining.		
	15.01 Key Ideas and Details		
	15.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	15.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	15.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	15.02 Craft and Structure		
	15.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	15.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	15.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
15.03	Integration of Knowledge and Ideas		
	15.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	15.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	15.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
15.04	Range of Reading and Level of Text Complexity		
	15.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	15.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
16.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Machining.		
16.01	Text Types and Purposes		
	16.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	16.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	16.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
16.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	16.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	16.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	16.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
16.03	Research to Build and Present Knowledge		
	16.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	16.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	16.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
16.04	Range of Writing		
	16.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Machining.		
17.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
17.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
17.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
17.04 Model with mathematics. MAFS.K12.MP.4.1	
17.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
17.06 Attend to precision. MAFS.K12.MP.6.1	
17.07 Look for and make use of structure. MAFS.K12.MP.7.1	
17.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
22.0 Operate milling machines--The student will be able to:			
22.01 Identify the parts of a vertical milling machine and explain their uses.			
22.02 Comply with safe and efficient work practices.			
22.03 True up the head and align milling fixtures.			
22.04 Select and set feeds and speeds for milling work.			
22.05 Square up workpieces with a table vise.			
22.06 Perform end milling.			
22.07 Perform fly-cutting operations.			
22.08 Drill holes with milling machines.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
22.09 Perform reaming operations.			
22.10 Perform form milling.			
22.11 Mill an external radius.			
22.12 Mill an angle.			
22.13 Use an edge finder and wiggler.			
22.14 Identify the parts of vertical and horizontal milling machines and explain their uses.			
22.15 Select the correct set up and operation for different milling machines.			
22.16 Cut external keyways.			
22.17 Bore holes with boring head.			
22.18 Mill cylindrical work.			
22.19 Set up and perform slab mil operations.			
22.20 Use digital readouts.			
22.21 Perform straddle milling operations on the horizontal mill.			
22.22 Set up and operate power tapping head.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 5**
Course Number: **8754050**
Course Credit: **1**

Course Description:

This course develops competencies required to operate grinding machines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
23.0 Operate grinding machines--The student will be able to:			
23.01 Identify the parts of a grinding machine and explain their uses.			
23.02 Comply with safe and efficient work practices.			
23.03 Set up and grind parallel flat surfaces.			
23.04 Select the proper wheel.			
23.05 Inspect, balance, dress, and true grinding wheels.			
23.06 Attach and align workpieces for grinding operations.			
23.07 Set up and grind four sides square.			
23.08 Select and set feeds and speeds for power-feed grinding machines.			
23.09 Cut or part workpieces with grinding machines.			
23.10 Set up and use angle plates.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	23.11 Grind to a shoulder.			
	23.12 Grind a taper.			
24.0	Solve problems using critical thinking skills, creativity and innovation--The students will be able to:		SC.912.N.1.1, 4, 7 SC.912.N.4.1	
	24.01 Employ critical thinking skills independently and in teams to solve problems and make decisions.			
	24.02 Employ critical thinking and interpersonal skills to resolve conflicts.			
	24.03 Identify and document workplace performance goals and monitor progress toward those goal.			
	24.04 Conduct technical research to gather information necessary for decision-making.			
25.0	Demonstrate the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance--The students will be able to:			
	25.01 Describe personal and jobsite safety rules and regulations that maintain safe and healthy work environments.			
	25.02 Explain emergency procedures to follow in response to workplace accidents.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 6**
Course Number: **8754060**
Course Credit: **1**

Course Description:

This course develops competencies math, blueprint reading and inspection methods.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
26.0	Solve advanced job-related math problems--The student will be able to:			
26.01	Solve job-related problems using basic formulas, geometry, and trigonometry.			
26.02	Convert measurements from English to metric and from metric to English units.			
27.0	Interpret blueprints and machine operations--The student will be able to: (Depending on training plans this outcome may be completed in OCP A under outcome 03.0)			
27.01	Read and interpret blueprints, including those with geometric tolerancing.			
27.02	Determine and interpret reference information used in performing machine work.			
27.03	Comply with safe and efficient work practices.			
27.04	Lay out radial and bolt hole circles.			
27.05	Inspect, remove, and replace manufactured parts that need repair or machine work.			
27.06	Select the most productive tool and tooling for a given operation.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
28.0 Demonstrate inspection methods--The student will be able to:			
28.01 Comply with safe and efficient work practices.			
28.02 Measure with sine bars.			
28.03 Take readings with hardness testers.			
28.04 Explain the purpose of statistical process control (SPC).			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 7**
Course Number: **8754070**
Course Credit: **1**

Course Description:

This course develops introductory competencies required to operate CNC machines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
29.0	Operate a computerized-numerical-control (CNC) machine--The student will be able to:			
29.04	Identify parts of a CNC machine and explain their uses(s).			
29.05	Follow safe and efficient work practices, including procedures sheets.			
29.06	Identify unusual machine noises.			
29.07	Adjust machine speeds and feeds according to specifications.			
29.08	Inspect parts for correct dimensions.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 8**
Course Number: **8754080**
Course Credit: **1**

Course Description:

This course develops competencies required to operate EDM machines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
30.0	Operate and set up electrical discharge machine (EDM)--The student will be able to:		SC.912.P.10.1, 2, 3, 5, 14	
30.01	Identify parts of the machine and explain their uses.			
30.02	Comply with safe and efficient work practices.			
30.03	Follow procedure sheets.			
30.04	Set up and adjust machine controls according to specifications.			
30.05	Select and manufacture electrode.			
30.06	Select flushing techniques.			
30.07	Create part according to specifications.			
30.08	Perform wire EDM programming.			
31.0	Use information technology tools--The students will be able to:			
31.01	Use personal information management (PIM) applications to increase workplace efficiency.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
31.02 Employ technological tools to expedite workflow including word processing, databases, reports, spreadsheets, multimedia presentations, electronic calendar, contacts, email, and internet applications.			
31.03 Employ computer operations applications to access, create, manage, integrate, and store information.			
31.04 Employ collaborative/groupware applications to facilitate group work.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 9**
Course Number: **8754090**
Course Credit: **1**

Course Description:

This course develops competencies required to operate CNC machines.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
32.0	Set up and operate a computerized-numerical-control (CNC) machine--The student will be able to:			
32.01	Comply with safe and efficient work practices.			
32.02	Set up work holding devices.			
32.03	Select proper cutting tools.			
32.04	Write a basic program and apply basic programming skills.			
32.05	Adjust appropriate cutting tools and tool offsets.			
32.06	Machine and create parts to blueprint tolerances.			
33.0	Use computer-aided design/computer-aided manufacturing (CAD/CAM) processes--The student will be able to:			
33.01	Identify parts of the machine and explain their uses.			
33.02	Identify CAD/CAM processes.			
33.03	Comply with safe and efficient work practices.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
33.04 Create a multidimensional geometry of parts.			
33.05 Create a CNC code from parts geometry.			
33.06 Set up and manufacture parts.			

Florida Department of Education
Student Performance Standards

Course Title: **Machining 10**
Course Number: **8754091**
Course Credit: **1**

Course Description:

This course develops competencies required in advanced machining operations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
34.0 Perform advanced lathe operations--The student will be able to:			
34.01 Rechase threads with lathes.			
34.02 Cut internal threads with lathes.			
34.03 Set up and perform taper turning with taper attachments.			
34.04 Set up and perform taper turning with the compound rest.			
34.05 Cut internal tapered surfaces.			
34.06 Set up and use follower and steady rests.			
35.0 Perform advanced milling operations--The student will be able to:			
35.01 Perform indexing operations using a dividing head.			
35.02 Set up and operate rotary tables.			
36.0 Perform advanced grinding operations--The student will be able to:			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
36.01	Set up grinders to run workpieces between centers. (optional)			
36.02	Set up and use radius dressers. (optional)			
36.03	Operate cylindrical grinders. (optional)			
36.04	Set up and operate inside diameter (ID) grinders. (optional)			
37.0	Set up and operate heat-treating furnaces--The student will be able to: (optional)			
37.01	Identify the parts of the machine and explain their uses.			
37.02	Identify and select proper machine controls.			
37.03	Comply with safe and efficient work practices.			
37.04	Select and identify proper heat-treatment processes.			
37.05	Perform a basic heat-treatment process to blueprint specifications.			
38.0	Demonstrate leadership and teamwork skills needed to accomplish team goals and objectives--The students will be able to:			
38.01	Employ leadership skills to accomplish organizational goals and objectives.			
38.02	Establish and maintain effective working relationships with others in order to accomplish objectives and tasks.			
38.03	Conduct and participate in meetings to accomplish work tasks.			
38.04	Employ mentoring skills to inspire and teach others.			
39.0	Explain the importance of employability and entrepreneurship skills--The students will be able to:			
39.01	Identify and demonstrate positive work behaviors needed to be employable.			
39.02	Develop personal career plan that includes goals, objectives, and strategies.			
39.03	Examine licensing, certification, and industry credentialing requirements.			
39.04	Maintain a career portfolio to document knowledge, skills, and experience.			
39.05	Evaluate and compare employment opportunities that match career goals.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
39.06 Identify and exhibit traits for retaining employment.			
39.07 Identify opportunities and research requirements for career advancement.			
39.08 Research the benefits of ongoing professional development.			
39.09 Examine and describe entrepreneurship opportunities as a career planning option.			

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Sheet Metal Fabrication Technology**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8754100
CIP Number	0648050600
Grade Level	9-12, 30, 31
Standard Length	9 credits
Teacher Certification	SHEETMETAL @7 7G METAL WORK 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2211 – Sheet Metal Workers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in sheet metal fabrication positions.

The content includes but is not limited to communication skills, leadership skills, human relations and employability skills, safe and efficient work practices, and the layout, fabrication, erection, or installation and maintenance of items made of sheet steel, copper, stainless steel and aluminum using hand tools and machines.

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.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8754110	Sheet Metal Fabrication 1	1 credit		2
	8754120	Sheet Metal Fabrication 2	1 credit		2
A	8754130	Sheet Metal Fabrication 3	1 credit	47-2211	2
	8754140	Sheet Metal Fabrication 4	1 credit		2
B	8754150	Sheet Metal Fabrication 5	1 credit	47-2211	2
C	8754160	Sheet Metal Fabrication 6	1 credit	47-2211	2
	8754170	Sheet Metal Fabrication 7	1 credit		2
D	8754180	Sheet Metal Fabrication 8	1 credit	47-2211	2
E	8754190	Sheet Metal Fabrication 9	1 credit	47-2211	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Sheet Metal Fabrication 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Sheet Metal Fabrication 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Sheet Metal Fabrication 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Sheet Metal Fabrication.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Sheet Metal Fabrication.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.
04.0 Demonstrate understanding of procedures and trade safety practices.
05.0 Read blueprints.
06.0 Lay out sheet metal.
07.0 Describe metals and their properties.
08.0 Describe the operation of metal working machines.
09.0 Perform metal fabrication operations.
10.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Sheet Metal Fabrication.
11.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Sheet Metal Fabrication.
12.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.
13.0 Demonstrate science knowledge and skills.
14.0 Explain the importance of employability and entrepreneurship skills.
15.0 Fabricate mechanical systems.
16.0 Install mechanical systems.
17.0 Fabricate architectural/roofing sheet metal.
18.0 Install architectural/roofing sheet metal.
19.0 Fabricate specialty sheet metal.
20.0 Fabricate food and beverage dispensing equipment.
21.0 Weld sheet metal.
22.0 Perform gas welding and cutting operations.
23.0 Perform electric metal-bonding operations.

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 1**
Course Number: **8754110**
Course Credit: **1**

Course Description:

This course develops introductory skills necessary in sheet metal fabrication occupations.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Sheet Metal Fabrication.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Sheet Metal Fabrication.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate understanding of procedures and trade safety practices--The student will be able to:		
04.01 Apply safety rules and procedures.		
04.02 Explain school/class procedures.		
04.03 Demonstrate use and care of tools.		
05.0 Read blueprints--The student will be able to:		
05.01 Interpret detail drawings.		
05.02 Read symbols.		
05.03 List materials for fabrication from blueprints.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
05.04	Develop shop drawings, drafting, sketching, and demonstrate computer usage and CAD operation.		
06.0	Lay out sheet metal--The student will be able to:		
06.01	Perform basic geometric construction		
06.02	Use marking gages, center punches, scribes, surface gages, squares, dividers, protractors, and circumference rules.		
06.03	Develop patterns using parallel line, radial line and triangulation.		
06.04	Make metal fabrication sketches.		
06.05	Read and measure with steel rules.		
06.06	Read and measure with micrometers.		
06.07	Read and measure with dial calipers.		
06.08	Read and measure with universal bevel protractor.		
06.09	Layout work place using marking gages, center punches, scribes, surface gages, squares, dividers, protractors, and circumference rules.		
06.10	Perform flat pattern bracket layouts.		
06.11	Perform cone development, construct radial line and use triangulation.		
06.12	Lay out rectangular straight duct.		
06.13	Lay out rectangular square throat and square heel duct elbow.		
06.14	Lay out rectangular duct ogee offset.		
06.15	Lay out rectangular taper duct (centerline taper).		
06.16	Lay out rectangular duct y branch.		
06.17	Lay out round straight duct.		
06.18	Lay out round duct elbow.		
06.19	Lay out round duct y branch.		
06.20	Lay out round duct offset.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
06.21 Lay out round duct taper (transitional).		
06.22 Lay out round duct lateral (round tap).		
06.23 Lay out batten seam metal roof panel and cap.		
06.24 Lay out square hopper.		
06.25 Lay out belt guard.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 2**
Course Number: **8754120**
Course Credit: **1**

Course Description:

This course is an introduction to metals, setting up and operating metalworking machines, equipment and tools related to the sheet metal fabrication industry.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Sheet Metal Fabrication.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Sheet Metal Fabrication.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
07.0 Describe metals and their properties--The student will be able to:		
07.01 Describe the steelmaking process.		
07.02 Describe the difference between ferrous and nonferrous metals.		
07.03 Describe casting, alloys and forging.		
07.04 Identify metals such as galvanized iron and steel, aluminum stainless steel, sheet metal, copper and brass.		
07.05 Identify properties of the most common metals.		
07.06 Identify and describe common gages, shapes and dimensions of purchased materials.		
08.0 Describe the operation of metalworking machines--The student will be able to:		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
08.01 Identify the purpose of various types of sheet metal shop equipment.		
08.02 Identify types of drill presses.		
08.03 Operate a drill press utilizing the correct drilling speed.		
08.04 Operate a band saw utilizing the correct cutting speed.		
08.05 Demonstrate clamping devices for securing stock for drilling.		
08.06 Identify types and sizes of drill bits.		
08.07 Use portable power saw equipment.		
08.08 Use a cutoff or power hacksaw.		
08.09 Use electric and air utility grinders.		
08.10 Sharpen drill bits.		
08.11 Select proper type of abrasive wheels for grinding machines.		
08.12 Describe large belt sanders.		
08.13 Describe power press brake.		
08.14 Describe power metal shear.		
08.15 Describe various manual brakes.		
08.16 Describe bench grinders.		
08.17 Describe beverly shear.		
08.18 Describe unishear.		
09.0 Perform metal fabrication operations--The student will be able to:		
09.01 Fabricate metal, edges and seams.		
09.02 Use hand tools to cut, punch and shear metal.		
09.03 Form sheet metal using a brake, a folder, rolls and a turning machine.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.04 Join metals using solder, rivets and mechanical fasteners.		
09.05 Make fixtures as required (Micarta and Mild Steel).		
09.06 Arrange proper setup in vise using safety devices.		
09.07 Demonstrate ability to cut various shapes of metal stock.		
09.08 Demonstrate ability to bend various shapes of metal stock.		
09.09 Inspect fabricated parts.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 3**
Course Number: **8754130**
Course Credit: **1**

Course Description:

This course develops competencies in related science, employability skills and entrepreneurship.

Florida Standards			Correlation to CTE Program Standard #
10.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Sheet Metal Fabrication.		
	10.01 Key Ideas and Details		
	10.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	10.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	10.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	10.02 Craft and Structure		
	10.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	10.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	10.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
10.03	Integration of Knowledge and Ideas		
	10.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	10.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	10.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
10.04	Range of Reading and Level of Text Complexity		
	10.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	10.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
11.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Sheet Metal Fabrication.		
11.01	Text Types and Purposes		
	11.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	11.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	11.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
11.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	11.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	11.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	11.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
11.03	Research to Build and Present Knowledge		
	11.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	11.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	11.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
11.04	Range of Writing		
	11.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
12.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.		
12.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
12.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
12.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
12.04 Model with mathematics. MAFS.K12.MP.4.1	
12.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
12.06 Attend to precision. MAFS.K12.MP.6.1	
12.07 Look for and make use of structure. MAFS.K12.MP.7.1	
12.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
13.0 Demonstrate science knowledge and skills--The students will be able to:		
13.01 Discuss the role of creativity in constructing scientific questions, methods and explanations.		
13.02 Formulate scientifically investigable questions, construct investigations, collect and evaluate data, and develop scientific recommendations based on findings.		
14.0 Explain the importance of employability and entrepreneurship skills--The students will be able to:		
14.01 Identify and demonstrate positive work behaviors needed to be employable.		
14.02 Develop personal career plan that includes goals, objectives, and strategies.		
14.03 Examine licensing, certification, and industry credentialing requirements.		
14.04 Maintain a career portfolio to document knowledge, skills, and experience.		
14.05 Evaluate and compare employment opportunities that match career goals.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
14.06 Identify and exhibit traits for retaining employment.		
14.07 Identify opportunities and research requirements for career advancement.		
14.08 Research the benefits of ongoing professional development.		
14.09 Examine and describe entrepreneurship opportunities as a career planning option.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 4**
Course Number: **8754140**
Course Credit: **1**

Course Description:

This course develops competencies and skills in fabricating the parts associated with mechanical systems usually related to the HVAC industry.

Florida Standards			Correlation to CTE Program Standard #
10.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Sheet Metal Fabrication.		
	10.01 Key Ideas and Details		
	10.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	10.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	10.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	10.02 Craft and Structure		
	10.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	10.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	10.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
10.03	Integration of Knowledge and Ideas		
	10.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	10.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	10.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
10.04	Range of Reading and Level of Text Complexity		
	10.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	10.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
11.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Sheet Metal Fabrication.		
11.01	Text Types and Purposes		
	11.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	11.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	11.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
11.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	11.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	11.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	11.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
11.03	Research to Build and Present Knowledge		
	11.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	11.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	11.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
11.04	Range of Writing		
	11.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
12.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Sheet Metal Fabrication.		
12.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
12.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
12.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
12.04 Model with mathematics. MAFS.K12.MP.4.1	
12.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
12.06 Attend to precision. MAFS.K12.MP.6.1	
12.07 Look for and make use of structure. MAFS.K12.MP.7.1	
12.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Fabricate mechanical systems--The student will be able to:		
15.01 Fabricate rectangular radius throat and radius heel duct elbow.		
15.02 Fabricate rectangular square throat and square heel duct elbow.		
15.03 Fabricate rectangular duct ogee offset.		
15.04 Fabricate rectangular duct transition.		
15.05 Fabricate rectangular duct Y branch.		
15.06 Fabricate rectangular shoe tap.		
15.07 Fabricate round straight duct.		
15.08 Fabricate round duct elbow.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.09 Fabricate round duct Y branch.		
15.10 Fabricate round duct offset.		
15.11 Fabricate round duct taper (transitional).		
15.12 Fabricate round duct lateral (round tap).		
15.13 Fabricate round saddle tap.		
15.14 Fabricate single wall equipment casing/housing.		
15.15 Fabricate flat S.		
15.16 Fabricate bar S.		
15.17 Fabricate drive cleat.		
15.18 Fabricate pocket government lock.		
15.19 Fabricate companion angle.		
15.20 Fabricate flanged duct section.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 5**
Course Number: **8754150**
Course Credit: **1**

Course Description:

This course develops competencies and skills for installing mechanical systems and fabricating metal roofing systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Install mechanical systems--The student will be able to:		
16.01 Install rectangular duct system.		
16.02 Install round duct system.		
16.03 Install single wall equipment casing/housing.		
17.0 Fabricate architectural/roofing sheet metal--The student will be able to:		
17.01 Fabricate batten seam metal roof panel and cap.		
17.02 Fabricate standing seam metal roof panel.		
17.03 Fabricate metal flat-lock roof panel.		
17.04 Fabricate ogee gutter.		
17.05 Fabricate half-round gutter.		
17.06 Fabricate rectangular downspout/conductor.		
17.07 Fabricate offset in rectangular downspout/conductor.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 6**
Course Number: **8754160**
Course Credit: **1**

Course Description:

This course develops competencies in fabricating and installing metal roofing systems.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.0 Fabricate architectural/roofing sheet metal--The student will be able to:		
17.08 Fabricate conductor head.		
17.09 Fabricate flashing.		
17.10 Fabricate roof coping.		
17.11 Fabricate gravel stop fascia.		
17.12 Fabricate metal siding panel.		
17.13 Fabricate louver.		
17.14 Fabricate metal ceiling panel.		
18.0 Install architectural/roofing sheet metal--The student will be able to:		
18.01 Install batten seam metal roof panel and cap.		
18.02 Install standing seam metal roof panel.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
18.03 Install metal flat-lock roof panel.		
18.04 Install ogee gutter.		
18.05 Install half-round gutter.		
18.06 Install rectangular downspout/conductor.		
18.07 Install offset in rectangular downspout/conductor.		
18.08 Install conductor head.		
18.09 Install flashing.		
18.10 Install coping.		
18.11 Install gravel stop fascia.		
18.12 Install metal siding.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 7**
Course Number: **8754170**
Course Credit: **1**

Course Description:

This course develops competencies in fabricating specialty sheet metal parts.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
19.0 Fabricate specialty sheet metal--The student will be able to:		
19.01 Fabricate rectangular single blade damper in frame.		
19.02 Fabricate rectangular tube.		
19.03 Fabricate round tube.		
19.04 Fabricate hollow metal letter.		
19.05 Fabricate round duct support saddle (floor mounted).		
19.06 Fabricate belt guard.		
19.07 Fabricate blind/drapery pocket (cornice).		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 8**
Course Number: **8754180**
Course Credit: **1**

Course Description:

This course develops competencies in fabricating specialty equipment for food and beverage dispensing.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
20.0 Fabricate food and beverage dispensing equipment--The student will be able to:		
20.01 Fabricate counter top.		
20.02 Fabricate shelf.		
20.03 Fabricate cabinet shell.		
20.04 Fabricate cabinet drawer.		
20.05 Fabricate cabinet sliding door.		
20.06 Fabricate sink and tub.		

Florida Department of Education
Student Performance Standards

Course Title: **Sheet Metal Fabrication 9**
Course Number: **8754190**
Course Credit: **1**

Course Description:

This course develops competencies and skills in welding and bonding sheet metal.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
21.0 Weld sheet metal--The student will be able to:		
21.01 Weld aluminum with gas tungsten arc welding (GTAW) equipment.		
21.02 Weld aluminum with gas metal arc welding (GMAW) equipment.		
21.03 Weld stainless steel with gas metal arc welding (GMAW) equipment.		
21.04 Weld stainless steel with shielded metal arc welding (SMAW) equipment.		
22.0 Perform gas welding and cutting operations--The student will be able to:		
22.01 Identify welding cylinders, regulators, hoses, pressure gages and torches.		
22.02 Describe welding equipment safety procedures.		
22.03 Demonstrate proper flame settings.		
22.04 Demonstrate basic gas welding skills.		
22.05 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
22.06 Demonstrate freehand and guide cutting of various metal thickness'.		
22.07 Set up and operate a plasma arc-cutting machine.		
23.0 Perform electric metal-bonding operations--The student will be able to:		
23.01 Describe and demonstrate the spot and arc welding process.		
23.02 Demonstrate basic procedures for safety adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions and clamping.		
23.03 Set up and operate a spot welder.		
23.04 Explain and demonstrate the MIG welding process.		
23.05 Apply basic procedures for safety adjusting, operating, cleaning and maintaining MIG welding equipment.		
23.06 Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips and choosing filler metal.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Sheet Metal Fabrication programs:

Sheet Metal Fabrication - I480506 (0648050600)
Sheet Metal Fabrication 1 - J360100 (0648050601)
Sheet Metal Fabrication 2 - J360200 (0648050602)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Precision Metal Fabrication**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8754300
CIP Number	0648050100
Grade Level	9-12, 30, 31
Standard Length	10 credits
Teacher Certification	SHEETMETAL @7 7G METAL WORK 7G WELDING @7 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	47-2211 – Sheet Metal Workers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in precision metal fabrication positions.

The content includes but is not limited to measurement and layout, planning and design, sheet metal work, structural steel, welding, mechanical fasteners, metal properties, heat treating and metalworking tools. The course content should also include training in communication, leadership, human relations and employability skills; and safe, efficient work practices.

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 four occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8754310	Metal Fabrication 1	1 credit		2
	8754320	Metal Fabrication 2	1 credit		2
A	8754330	Metal Fabrication 3	1 credit	47-2211	2
B	8754340	Metal Fabrication 4	1 credit	47-2211	2
	8754350	Metal Fabrication 5	1 credit		2
	8754360	Metal Fabrication 6	1 credit		2
	8754370	Metal Fabrication 7	1 credit		2
	8754380	Metal Fabrication 8	1 credit		2
C	8754390	Metal Fabrication 9	1 credit	47-2211	2
D	8754391	Metal Fabrication 10	1 credit	47-2211	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Metal Fabrication 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Metal Fabrication 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 9	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Metal Fabrication 10	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Precision Metal Fabrication.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Precision Metal Fabrication.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.
04.0 Demonstrate basic metal fabrication skills.
05.0 Demonstrate ability to read plans and drawings.
06.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Precision Metal Fabrication.
07.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Precision Metal Fabrication.
08.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.
09.0 Describe metals and their properties.
10.0 Perform gas welding and cutting operations.
11.0 Perform measuring and layout operations.
12.0 Operate metalworking machines.
13.0 Perform metal fabrication operations.
14.0 Perform electric metal-bonding operations.
15.0 Perform assembly operation.
16.0 Demonstrate ability to apply geometric form and position control.
17.0 Organize and plan work.

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 1**
Course Number: **8754310**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with facilities, safety and housekeeping rules. The student will also become familiar with materials and specifications, skilled in using measuring and layout tools.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Precision Metal Fabrication.		
01.01	Key Ideas and Details		
01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1		
01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2		
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3		
01.02	Craft and Structure		
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4		
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5		

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Precision Metal Fabrication.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.0 Demonstrate basic metal fabrication skills--The student will be able to:		
04.01 Comply with safety and operating rules and practices.		
04.02 Maintain a clean and orderly shop.		
04.03 Make job-related decimal and fraction calculations.		
04.04 Solve job-related problems by adding, subtracting, multiplying and dividing numbers.		
04.05 Solve job-related problems operating a hand-held calculator.		
04.06 Solve job-related problems using mathematical handbooks, charts and tables.		
04.07 Compute feet, inches and yards.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
04.08 Use the protractor to measure angles to nearest degree.		
04.09 Use the protractor and triangles to draw angles.		
04.10 Demonstrate proper use of material handling techniques.		
04.11 Solve job-related problems using basic formulas.		
04.12 Solve job-related problems using basic geometry.		
04.13 Solve job-related problems using basic trigonometry.		
04.14 Calculate the amount of material that is required to fabricate project.		
04.15 Calculate machine feed and speed by using formulas.		
04.16 Calculate set back and bend allowance.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 2**
Course Number: **8754320**
Course Credit: **1**

Course Description:

This course is designed to familiarize the students with plans and drawings. The student will be familiar with basic science as it applies to metal fabrication.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Precision Metal Fabrication.		
01.01	Key Ideas and Details		
01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1		
01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2		
01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3		
01.02	Craft and Structure		
01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4		
01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5		

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Precision Metal Fabrication.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.0 Demonstrate ability to read plans and drawings--The student will be able to:		
05.01 Identify dimensions.		
05.02 Identify lists of materials and specifications.		
05.03 Identify section views/detail views.		
05.04 Disassemble and assemble parts using an exploded view drawing.		
05.05 Interpret blueprint abbreviations.		
05.06 Identify dimensioning of radii, round holes, fillets and chamfers.		
05.07 Identify screw threads and bolt types.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
05.08 Apply dimensional tolerances.		
05.09 Identify metal fabrication symbols used in blueprints.		
05.10 Read and interpret title block information.		
05.11 Identify and interpret rivet call outs.		
05.12 Identify and interpret weld call outs.		
05.13 Identify and interpret general and local notes.		
05.14 Describe the use of assembly blueprints and detail blueprints.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 3**
Course Number: **8754330**
Course Credit: **1**

Course Description:

This course is designed to develop basic skills in metals and their properties.

Florida Standards			Correlation to CTE Program Standard #
06.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Precision Metal Fabrication.		
	06.01 Key Ideas and Details		
	06.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	06.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	06.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	06.02 Craft and Structure		
	06.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	06.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	06.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
06.03	Integration of Knowledge and Ideas		
	06.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	06.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	06.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
06.04	Range of Reading and Level of Text Complexity		
	06.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	06.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
07.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Precision Metal Fabrication.		
07.01	Text Types and Purposes		
	07.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	07.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	07.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
07.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	07.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	07.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	07.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
07.03	Research to Build and Present Knowledge		
	07.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	07.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	07.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
07.04	Range of Writing		
	07.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.		
08.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
08.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
08.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
08.04 Model with mathematics. MAFS.K12.MP.4.1	
08.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
08.06 Attend to precision. MAFS.K12.MP.6.1	
08.07 Look for and make use of structure. MAFS.K12.MP.7.1	
08.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSS-Sci

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
09.0 Describe metals and their properties--The student will be able to:		
09.01 Describe the steelmaking process.		
09.02 Describe the differences between ferrous and nonferrous metals.		
09.03 Describe casting, alloys and forging.		
09.04 Identify metals such as galvanized iron and steel, aluminum stainless steel, sheet metal, copper and brass.		
09.05 Identify properties of the most common metals.		
09.06 Identify and describe common gages, shapes and dimensions of purchased materials.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 4**
Course Number: **8754340**
Course Credit: **1**

Course Description:

This course is designed to develop skills in the safe use of gas welding and cutting equipment.

Florida Standards			Correlation to CTE Program Standard #
06.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Precision Metal Fabrication.		
	06.01 Key Ideas and Details		
	06.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	06.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	06.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	06.02 Craft and Structure		
	06.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	06.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	06.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
06.03	Integration of Knowledge and Ideas		
	06.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	06.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	06.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
06.04	Range of Reading and Level of Text Complexity		
	06.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	06.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
07.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Precision Metal Fabrication.		
07.01	Text Types and Purposes		
	07.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	07.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	07.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
07.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	07.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	07.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	07.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
07.03	Research to Build and Present Knowledge		
	07.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	07.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	07.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
07.04	Range of Writing		
	07.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
08.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Precision Metal Fabrication.		
08.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
08.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
08.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
08.04 Model with mathematics. MAFS.K12.MP.4.1	
08.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
08.06 Attend to precision. MAFS.K12.MP.6.1	
08.07 Look for and make use of structure. MAFS.K12.MP.7.1	
08.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
10.0 Perform gas welding and cutting operations--The student will be able to:		
10.01 Identify welding cylinders, regulators, hoses, pressure gages and torches.		
10.02 Describe welding equipment safety procedures.		
10.03 Demonstrate proper flame settings.		
10.04 Demonstrate basic gas welding skills.		
10.05 Demonstrate procedures for adjusting and operating the oxyacetylene cutting torch.		
10.06 Demonstrate freehand and guide cutting of various metal thicknesses.		
10.07 Set up and operate a plasma arc cutting machine.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 5**
Course Number: **8754350**
Course Credit: **1**

Course Description:

This course is designed to develop skills in measuring and layout operations, the operation of metal working machines and metal fabrication.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.0	Perform measuring and layout operations--The student will be able to:		
11.01	Perform basic geometric construction.		
11.02	Use marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surfaceplates, depth gates and circumference rules.		
11.03	Develop patterns using parallel line, radial line and triangulation.		
11.04	Make metal fabrication sketches.		
11.05	Read and measure with steel rules.		
11.06	Read and measure with micrometers.		
11.07	Read and measure with vernier height gages.		
11.08	Read and measure with dial calipers.		
11.09	Read and measure with universal bevel protractor.		
11.10	Measure with sine bars.		
11.11	Read and measure with dial indicators.		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
11.12	Apply parallel bars, angle plates and surface gages to precision measurement operations.		
11.13	Apply "V" blocks to precision measurement operations.		
11.14	Use gage blocks in establishing measurement.		
11.15	Layout work piece using marking gages, center punches, scribes, surface gages, squares, dividers, dial indicators, protractors, surface plates, depth gages and circumference rules.		
11.16	Perform flat pattern bracket layouts.		
11.17	Perform cone development, construct radial line and use triangulation.		
12.0	Operate metalworking machines--The student will be able to:		
12.01	Identify the purpose of various types of machine shop equipment.		
12.02	Identify types of a drill press.		
12.03	Operate a drill press utilizing the correct drilling speed.		
12.04	Operate a band saw utilizing the correct cutting speed.		
12.05	Demonstrate clamping devices for securing stock for drilling.		
12.06	Identify types and sizes of drill bits.		
12.07	Use portable power saw equipment.		
12.08	Use a cutoff or power hacksaw.		
12.09	Use electric and air utility grinders.		
12.10	Sharpen drill bits.		
12.11	Select proper type of abrasive wheels for grinding machines.		
12.12	Operate large belt sander.		
12.13	Operate power press brake.		
12.14	Operate power metal shear.		
12.15	Operate various manual brakes.		
12.16	Operate power jitterbug shear.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
12.17 Operate bench grinders.		
12.18 Operate beverly shear.		
12.19 Operate unishear.		
13.0 Perform metal fabrication operations--The student will be able to:		
13.01 Fabricate metal, edges and seams.		
13.02 Use hand tools to cut, punch and shear metal.		
13.03 Form sheet metal using a brake, a folder, rolls and a turning machine.		
13.04 Join metals using solder, rivets and mechanical fasteners.		
13.05 Make fixtures as required (Micarta and Mild Steel).		
13.06 Arrange proper setup in vise using safety devices.		
13.07 Demonstrate ability to cut various shapes of metal stock.		
13.08 Demonstrate ability to bend various shapes of metal stock.		
13.09 Inspect fabricated parts.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 6**
Course Number: **8754360**
Course Credit: **1**

Course Description:

This course is designed to help the students demonstrate the ability to perform metal bonding operations and assembly operations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Perform electric metal-bonding operations--The student will be able to:		
14.01	Describe and demonstrate the spot and arc welding process.		
14.02	Demonstrate basic procedures for safely adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions and clamping.		
14.03	Setup and operate a spot welder.		
14.04	Explain and demonstrate the MIG welding process.		
14.05	Apply basic procedures for safely adjusting, operating, cleaning and maintaining MIG welding equipment.		
14.06	Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips and choosing filler metal.		
15.0	Perform assembly operation--The student will be able to:		
15.01	Identify weld symbols.		
15.02	Perform required weld preparation.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.03 Assist welder in weld operation.		
15.04 Identify rivet symbol.		
15.05 Install proper diameter holes and prepare metal surfaces for riveting.		
15.06 Determine whether rivet is to be "shot" or squeezed.		
15.07 Perform proper setup and upset rivets.		
15.08 Set up and install blind rivets.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 7**
Course Number: **8754370**
Course Credit: **1**

Course Description:

This course is designed to help the students demonstrate the ability to perform electric metal bonding operations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci
14.0	Perform electric metal-bonding operations--The student will be able to:		
14.01	Describe and demonstrate the spot and arc welding process.		
14.02	Demonstrate basic procedures for safely adjusting and operating an arc welder, selecting a rod, striking and maintaining an arc, welding in various positions and clamping.		
14.03	Setup and operate a spot welder.		
14.04	Explain and demonstrate the MIG welding process.		
14.05	Apply basic procedures for safely adjusting, operating, cleaning and maintaining MIG welding equipment.		
14.06	Apply basic procedures for safely adjusting and operating a TIG welder, welding in various positions, selecting proper tips and choosing filler metal.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 8**
Course Number: **8754380**
Course Credit: **1**

Course Description:

This course is designed to help the students demonstrate the ability to perform assembly operations.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
15.0 Perform assembly operation--The student will be able to:		
15.01 Identify weld symbols.		
15.02 Perform required weld preparation.		
15.03 Assist welder in weld operation.		
15.04 Identify rivet symbol.		
15.05 Install proper diameter holes and prepare metal surfaces for riveting.		
15.06 Determine whether rivet is to be "shot" or squeezed.		
15.07 Perform proper setup and upset rivets.		
15.08 Set up and install blind rivets.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 9**
Course Number: **8754390**
Course Credit: **1**

Course Description:

This course is designed to help the students demonstrate the ability to apply geometric form and position control.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.0 Demonstrate ability to apply geometric form and position control--The student will be able to:		
16.01 Identify material condition and perfect form.		
16.02 Identify the eleven form characteristics.		
16.03 Identify the two position characteristics.		
16.04 Identify the seven different tolerance zones.		
16.05 Identify datum symbols.		
16.06 Identify datum planes.		
16.07 Identify datum axis.		
16.08 Identify datum centerplane.		
16.09 Identify the three plan datum system and multiple datums.		
16.10 Identify material condition modifiers.		

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
16.11 Solve bonus tolerance applications.		
16.12 Solve datum zone applications.		
16.13 Identify tolerance value indicator.		
16.14 Identify American National Standards Institute.		
16.15 Identify International Standards Institute.		

Florida Department of Education
Student Performance Standards

Course Title: **Metal Fabrication 10**
Course Number: **8754391**
Course Credit: **1**

Course Description:

This course is designed to help the students demonstrate the ability to organize and plan work

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and NGSSS-Sci.

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci
17.0 Organize and plan work--The student will be able to:		
17.01 Interpret blueprints and drawings to acquire proper amount of material.		
17.02 Requisition proper tools and equipment to fabricate parts.		
17.03 Develop and project plan.		

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the following postsecondary Precision Metal Fabrication programs:

Precision Metal Fabrication - I480504 (0648050100)
Precision Metal Fabrication 1 - J310100 (0648050101)
Precision Metal Fabrication 2 - J310200 (0648050102)

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Applied Welding Technologies / New Name 2015-2016, Welding Technologies**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	8754500
CIP Number	0648050802
Grade Level	9-12, 30, 31
Standard Length	8 credits
Teacher Certification	WELDING @7 7G METAL WORK 7G
CTSO	SkillsUSA
SOC Codes (all applicable)	51-9198 – Helpers-Production Workers 51-4121 – Welders, Cutters, Solderers, and Brazers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in applied welding positions.

The content includes but is not limited to planning, management, finance, technical and product skills, underlying principles of technology, labor issues, community issues and health, safety, and environmental issues.

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 six occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
	8754510	Welding Technologies 1	1 credit		2
A	8754520	Welding Technologies 2	1 credit	51-9198	2
	8754530	Welding Technologies 3	1 credit		2
B	8754540	Welding Technologies 4	1 credit	51-4121	2
C	8754550	Welding Technologies 5	1 credit	51-4121	2
D	8754560	Welding Technologies 6	1 credit	51-4121	2
E	8754570	Welding Technologies 7	1 credit	51-4121	2
F	8754580	Welding Technologies 8	1 credit	51-4121	2

Academic Alignment Table

The courses comprising this program have not yet been aligned to the Next Generation Sunshine State Standards contained in specific math and science core academic courses. This alignment is a collaborative review by Career and Technical Education (CTE) teachers and core academic teachers. Once the program has been subjected to this alignment, this curriculum framework will include a table depicting the number of academic standards in each CTE course, the total number of math and science standards contained in the academic course, and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Welding Technologies 1	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 2	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 3	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 4	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 5	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Welding Technologies 6	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 7	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%
Welding Technologies 8	^^	^^	^^	0/53 0%	0/52 0%	0/56 0%	0/55 0%	0/58 0%	0/35 0%	0/42 0%	0/56 0%	0/53 0%

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

National Standards

Programs identified as having Industry or National Standards have been crosswalked with the corresponding standards and/or benchmarks. Industry or National Standards for the Welding Technologies program can be found using the following link:

http://www.aws.org/w/a/certification/CW/

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Welding Technologies.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Welding Technologies.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Welding Technologies.
04.0 Apply basic shop skills.
05.0 Apply basic oxyfuel gas cutting principles and practices.
06.0 Apply basic shielded metal arc welding (SMAW) skills.
07.0 Apply intermediate oxyfuel gas cutting principles and practices.
08.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Welding Technologies.
09.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Welding Technologies.
10.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Welding Technologies.
11.0 Apply intermediate shielded metal arc welding (SMAW) skills.
12.0 Apply visual examination skills.
13.0 Apply drawing and welding symbol interpretation skill.
14.0 Identify basic metals accurately.
15.0 Demonstrate arc cutting principles and practices.
16.0 Apply basic gas metal arc welding (GMAW) skills.
17.0 Apply intermediate gas metal arc welding (GMAW) skills.
18.0 Apply flux-cored arc welding (FCAW) skills.
19.0 Apply basic gas tungsten arc welding (GTAW) skills.
20.0 Apply intermediate gas tungsten arc welding (GTAW) skills.
21.0 Fabricate and weld carbon steel pipe joints.
22.0 Perform fabrication using welding skills.

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 1**
Course Number: **8754510**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with basic welding and cutting.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Welding Technologies.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Welding Technologies.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Welding Technologies.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Apply basic shop skills--The student will be able to:			
04.01 Apply communications and leadership skills.			
04.02 Apply safety and health practices.			
04.03 Apply measuring skills.			
04.04 Apply grinding skills.			
05.0 Apply basic oxyfuel gas cutting principles and practices--The student will be able to:			
05.01 Perform external inspections of equipment and accessories.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
05.02 Make minor repairs to equipment and accessories.			
05.03 Set up manual OFC operations for plain carbon steel.			
05.04 Operate manual oxyfuel cutting equipment.			
05.05 Perform straight cutting operations using manual oxyfuel cutting process on plain carbon steel.			
06.0 Apply basic shielded metal arc welding (SMAW) skills--The student will be able to:			
06.01 Perform external inspections of SMAW equipment and accessories.			
06.02 Make minor repairs to SMAW equipment and accessories.			
06.03 Set up shielded metal arc welding operations on plain carbon steel.			
06.04 Operate shielded metal arc welding equipment.			
06.05 Make fillet welds, all positions, on plain carbon steel.			
06.06 Make groove welds, all positions, on plain carbon steel.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 2**
Course Number: **8754520**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with intermediate metal cutting principles as well as welding technologies.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Welding Technologies.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Welding Technologies.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Welding Technologies.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-SCI, and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
07.0 Apply intermediate oxyfuel gas cutting principles and practices--The student will be able to:			
07.01 Apply intermediate manual oxyfuel gas cutting skills.			
07.02 Perform shape cutting operations on plain carbon steel.			
07.03 Perform bevel cutting operations on plain carbon steel.			
07.04 Remove weld metal on plain carbon steel using weld washing techniques.			
07.05 Apply machine oxyfuel gas cutting (track burner) skills.			
07.06 Perform safety inspections of equipment and accessories.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
07.07 Make minor external repairs to equipment and accessories.			
07.08 Set up for plain carbon steel machine OFC (track burner) operations.			
07.09 Operate machine oxyfuel gas cutting (track burner) equipment.			
07.10 Perform straight cutting operations on plain carbon steel.			
07.11 Perform bevel cutting operations on plain carbon steel.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 3**
Course Number: **8754530**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with intermediate shielded metal arc welding (SMAW) principles as well as interpreting drawings and sketches.

Florida Standards			Correlation to CTE Program Standard #
08.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Welding Technologies.		
08.01	Key Ideas and Details		
08.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
08.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
08.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
08.02	Craft and Structure		
08.02.1		Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
08.02.2		Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	08.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	
08.03	Integration of Knowledge and Ideas		
	08.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	08.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	08.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
08.04	Range of Reading and Level of Text Complexity		
	08.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	08.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Welding Technologies.		
09.01	Text Types and Purposes		
	09.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	09.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	09.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
09.02	Production and Distribution of Writing		
	09.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	09.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	09.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
09.03	Research to Build and Present Knowledge		
	09.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	09.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	09.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
09.04	Range of Writing		
	09.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
10.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Welding Technologies.		

Florida Standards	Correlation to CTE Program Standard #
10.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
10.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
10.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
10.04 Model with mathematics. MAFS.K12.MP.4.1	
10.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
10.06 Attend to precision. MAFS.K12.MP.6.1	
10.07 Look for and make use of structure. MAFS.K12.MP.7.1	
10.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci, and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
11.0 Apply intermediate shielded metal arc welding (SMAW) skills--The student will be able to:			
11.01 Make single "V" groove welds, all positions (visual inspection criteria, using (AWS) D1.1-96, 4.8.1 visual/inspection American Welding Society) on plain carbon steel with backing.			
11.02 Perform 1G - 4G limited thickness qualification (bend) tests on plain carbon steel plate. (Specification-use AWS D1.1-96, fig 4.30, 4.31 (will meet acceptance criteria AWS D1.1-96 -4.8.3.3)			
11.03 Will perform destructive root and face bend specimens (AWS D1.1-96 Fig 4.12).			
12.0 Apply visual examination skills--The student will be able to:			
12.01 Examine cut surfaces and edges of prepared base metal parts.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
12.02 Examine tack, intermediate pass and cover pass.			
12.03 Repair unacceptable weld profiles.			
13.0 Apply drawing and welding symbol interpretation skills--The student will be able to:			
13.01 Interpret basic elements of a drawing or sketch.			
13.02 Interpret welding symbol information.			
13.03 Fabricate parts from a drawing or sketch.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 4**
Course Number: **8754540**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with arc cutting principles and practices.

Florida Standards			Correlation to CTE Program Standard #
08.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Welding Technologies.		
	08.01 Key Ideas and Details		
	08.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	08.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	08.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	08.02 Craft and Structure		
	08.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	08.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	08.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
08.03	Integration of Knowledge and Ideas		
	08.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	08.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	08.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
08.04	Range of Reading and Level of Text Complexity		
	08.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	08.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
09.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Welding Technologies.		
09.01	Text Types and Purposes		
	09.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	09.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	09.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
09.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	09.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	09.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	09.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
	09.03	Research to Build and Present Knowledge	
	09.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	09.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	09.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
	09.04	Range of Writing	
	09.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
10.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Welding Technologies.		
	10.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	

Florida Standards	Correlation to CTE Program Standard #
10.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
10.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
10.04 Model with mathematics. MAFS.K12.MP.4.1	
10.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
10.06 Attend to precision. MAFS.K12.MP.6.1	
10.07 Look for and make use of structure. MAFS.K12.MP.7.1	
10.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
14.0 Identify basic metals accurately--The student will be able to:			
14.01 Identify metals by appearance and weight.			
14.02 Identify metals by spark test.			
14.03 Classify metals by magnetic properties.			
14.04 Identify metals by structural shapes.			
15.0 Demonstrate arc cutting principles and practices--The student will be able to:			
15.01 Apply Manual Air Carbon Arc Gouging and Cutting (CAC-A) skills.			
15.02 Perform safety inspections of equipment and accessories.			
15.03 Make minor external repairs to equipment and accessories.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
15.04 Set up plain carbon steel using manual air carbon arc gouging and cutting operations.			
15.05 Operate manual air carbon arc cutting equipment.			
15.06 Perform metal removal operations on plain carbon steel.			
15.07 Apply manual Plasma Arc Cutting (PAC) skills.			
15.08 Perform safety inspections of equipment and accessories.			
15.09 Make minor repairs to equipment and accessories.			
15.10 Set up for plain carbon steel, aluminum and stainless steel using plasma arc cutting operations.			
15.11 Operate manual plasma arc cutting equipment.			
15.12 Perform shape cutting operations on plain carbon steel, aluminum and stainless steel using plasma arc cutting process.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 5**
Course Number: **8754550**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with basic and intermediate gas metal arc welding (GMAW) skills.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
16.0	Apply basic gas metal arc welding (GMAW) skills--The student will be able to:			
16.01	Perform external inspections of GMAW equipment and accessories.			
16.02	Make minor repairs to GMAW equipment and accessories.			
16.03	Set up gas metal arc welding operations for plain carbon steel.			
16.04	Operate gas metal arc welding equipment.			
16.05	Make short-circuiting transfer fillet welds, all positions, on plain carbon steel.			
16.06	Make Groove welds, all positions, on plain carbon steel.			
17.0	Apply intermediate gas metal arc welding (GMAW) skills--The student will be able to:			
17.01	Make 1F Fillet- 2 Fillet spray transfer welds on plain carbon steel.			
17.02	Make 1G Groove Spray transfer welds on plain carbon steel.			
17.03	Set up (GMAW) gas metal arc welding equipment for aluminum, stainless steel.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
17.04 Make groove welds 1G Groove position on aluminum.			
17.05 Make fillet welds 1-3F position on stainless.			
17.06 Make groove welds 1-2G position on stainless.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 6**
Course Number: **8754560**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with flux cored arc welding (FCAW) and gas tungsten arc welding skills (GTAW).

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
18.0 Apply flux-cored arc welding (FCAW) skills--The student will be able to:			
18.01 Perform safety inspections of equipment and accessories.			
18.02 Make minor repairs to equipment and accessories.			
18.03 Set up for plain carbon steel FCAW operations.			
18.04 Operate flux cored arc welding equipment, self-shielded process.			
18.05 Make fillet welds and groove welds, all positions, on plain carbon steel.			
18.06 Operate flux cored arc welding equipment, gas-shielded process, to make fillet welds, all positions, on plain carbon steel.			
18.07 Operate flux covered arc welding equipment to make groove welds all positions, on plain carbon steel.			
19.0 Apply basic gas tungsten arc welding (GTAW) skills--The student will be able to:			
19.01 Perform external inspections of GTAW equipment and accessories.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
19.02 Make minor repairs to GTAW equipment and accessories.			
19.03 Set up for plain carbon steel, aluminum and stainless steel GTAW operations.			
19.04 Operate gas tungsten arc welding equipment.			
19.05 Make fillet welds, all position, on plain carbon steel.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 7**
Course Number: **8754570**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with fabricating and welding pipe joints and provide additional practice in gas tungsten arc welding (GTAW).

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
20.0	Apply intermediate gas tungsten arc welding (GTAW) skills--The student will be able to:			
20.01	Make groove welds, all positions, on plain carbon steel.			
20.02	Make 1F - 4F Fillet welds on aluminum.			
20.03	Make 1G Groove welds on aluminum.			
20.04	Make 1F - 3F Fillet welds on stainless steel.			
20.05	Make 1G - 2G Groove welds on stainless steel.			
21.0	Fabricate and weld carbon steel pipe joints--The student will be able to:			
21.01	Cut and prepare schedule 40 or 80 pipe for welding using current AWS and/or ASME specifications.			
21.02	Tack and weld carbon steel pipe in the 1G thru 6G position using SMAW process with carbon steel filler.			
21.03	Tack and weld carbon steel pipe in 1G thru 6G position using GTAW process with carbon steel and/or 309 stainless steel filler.			

Florida Department of Education
Student Performance Standards

Course Title: **Welding Technologies 8**
Course Number: **8754580**
Course Credit: **1**

Course Description:

This course is designed to familiarize the student with fabricating and welding various types of metals using drawings and blueprints.

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
22.0 Perform fabrication using welding skills--The student will be able to:			
22.01 Repair products of ferrous and non-ferrous metals.			
22.02 Fabricate products of ferrous and non-ferrous metals using working drawings and/or blue prints.			

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.

Revised: 2/27/2014

2014 – 2015

Florida Department of Education
Curriculum Framework

Program Title: **Automation and Production Technology**
Program Type: **Career Preparatory**
Career Cluster: **Manufacturing**

Secondary – Career Preparatory	
Program Number	9200100
CIP Number	0615040603
Grade Level	9-12, 30, 31
Standard Length	4 credits
Teacher Certification	AUTO PROD 7G ENG 7G ELECTRONIC @7 7G TECH ED 1 @ 2
CTSO	SkillsUSA
SOC Codes (all applicable)	51-2022 – Electrical and Electronic Equipment Assemblers
Facility Code	245 http://www.fldoe.org/edfacil/sref.asp (State Requirements for Educational Facilities)
Targeted Occupation List	http://www.labormarketinfo.com/wec/TargetOccupationList.htm
Perkins Technical Skill Attainment Inventory	http://www.fldoe.org/workforce/perkins/perkins_resources.asp
Industry Certifications	http://www.fldoe.org/workforce/fcpea/default.asp
Statewide Articulation	http://www.fldoe.org/workforce/dwdframe/artic_frame.asp

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 in the manufacturing 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 manufacturing career cluster. This program offers a broad foundation of knowledge and skills to prepare students for employment in Automation and Production positions.

The content includes but is not limited to providing students with a foundation of knowledge and technically oriented experiences in the study of automation technology, its application in manufacturing, engineering and robotics, and its effect upon our lives and the choosing of an occupation. The content and activities will also include the study of enterprise systems, safety, quality, and leadership skills. This program focuses on transferable skills and stresses understanding and demonstration of the technological tools, machines, instruments, materials, processes and systems in business and industry.

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 four occupational completion points.

The following table illustrates the **Secondary** program structure:

OCP	Course Number	Course Title	Length	SOC Code	Level
A	9200110	Automation and Production Technology 1	1 credit	51-2022	2
B	9200120	Automation and Production Technology 2	1 credit	51-2022	2
C	9200130	Automation and Production Technology 3	1 credit	51-2022	3
D	9200140	Automation and Production Technology 4	1 credit	51-2022	3

Academic Alignment Table

Some or all of the courses in this program have been academically aligned to the Florida Standards for Mathematics and the Next Generation Sunshine State Standards (NGSSS) for Science. The table below contains the results of the alignment efforts by both academic core and Career and Technical Education (CTE) professional educators. Data shown in the table includes the number of academic standards in the CTE course and the percentage of alignment to the CTE course.

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Automation and Production Technology 1	^^	^^	^^	#	#	#	#	#	#	#	#	11/53 21%
Automation and Production Technology 2	^^	^^	^^	#	#	#	1/55 2%	#	#	#	#	3/53 6%
Automation and Production Technology 3	^^	^^	^^	#	#	#	#	#	#	#	#	4/53 8%

Courses	Algebra 1	Algebra 2	Geometry	Anatomy/ Physiology Honors	Astronomy Solar/Galactic Honors	Biology 1	Chemistry 1	Earth-Space Science	Genetics	Marine Science 1 Honors	Physical Science	Physics 1
Automation and Production Technology 4	^^	^^	^^	**	**	**	**	**	**	**	**	**

^^ *Alignment pending full implementation of the Florida Standards for Mathematics.*

** *Alignment pending review*

\# *Alignment attempted, but no correlation to academic course*

Florida Standards for Technical Subjects

Florida Standards (FS) for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects are the critical reading and writing literacy standards designed for grade 6 and above. These standards are predicated on teachers of history/social studies, science, and technical subjects using their content area expertise to help students meet the particular challenges of reading, writing, speaking, listening, and language in their respective fields. It is important to note that the 6-12 literacy standards in history/social studies, science, and technical subjects are not meant to replace content standards in those areas but rather to supplement them.

This curriculum framework incorporates the grades 9-10 reading and writing literacy standards in the first two courses of this CTE program and grade 11-12 reading and writing literacy standards in the third and fourth courses of this CTE program. The standards for Mathematical Practices describe varieties of expertise that educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. This curriculum framework incorporates the appropriate mathematical practices in the first four courses of this CTE program.

Florida Standards for Mathematics & Language Arts (FS-M/LA)

Some or all of the courses in this program have been aligned to the Florida Standards for Mathematics and Language Arts used in core academic classes. Data shown in the framework table (column 'FS-M/LA') contains the results of these alignment efforts.

Next Generation Sunshine State Standards (NGSSS) - Science

Some or all of the courses in this program have been aligned to the Next Generation Sunshine State Standards (NGSSS) for Science. Data shown in the framework table (column 'NGSSS-Sci') contains the results of these alignment efforts.

National Standards

Programs identified as having Industry or National Standards have been crosswalked with the corresponding standards and/or benchmarks. Industry or National Standards for the Automation and Production Technology program can be found using the following link:

http://www.msscusa.org/production-certification-cpt/

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

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

01.0 Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Automation and Production Technology.
02.0 Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Automation and Production Technology.
03.0 Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.
04.0 Demonstrate an understanding of the core concepts of technology.
05.0 Demonstrate an understanding of the influence of technology on history as well as its cultural, social, economic, and political effects.
06.0 Demonstrate an understanding of the attributes of engineering design.
07.0 Demonstrate an understanding of employability skills and career opportunities in the fields of advanced manufacturing and engineering technologies.
08.0 Demonstrate an understanding of workplace safety and workplace organization.
09.0 Demonstrate an understanding of mechanisms.
10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
11.0 Demonstrate an understanding of thermal technology.
12.0 Demonstrate an understanding of communication and workplace computer skills.
13.0 Demonstrate the ability to read and interpret blueprints and schematics.
14.0 Demonstrate proficiently in the use of quality assurance methods and quality control concepts.
15.0 Demonstrate an understanding of modern business practices and enterprise systems.
16.0 Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Automation and Production Technology.
17.0 Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Automation and Production Technology.
18.0 Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.
19.0 Demonstrate an understanding of graphic design by generating and interpreting computer-aided drawings.
20.0 Demonstrate proficiency in using measurement tools, instruments and testing devices related to proper quality assurance methods.
21.0 Demonstrate a fundamental understanding of AC/DC electrical and electrical control.
22.0 Demonstrate an understanding of fluid power.
23.0 Demonstrate the abilities to use and maintain technological products and systems.
24.0 Demonstrate an understanding of and be able to select production processes.
25.0 Demonstrate an understanding of industrial tools and processes inclusive of: Basic Machine Tools, CNC machines, and Welding technology.
26.0 Demonstrate an understanding of computer aided manufacturing and flexible manufacturing planning and control.
27.0 Demonstrate proficiency in computer control and robotics.

28.0 Demonstrate the ability to properly identify, organize, plan, allocate resources, document and produce a mass-produced product via a master project.

Florida Department of Education
Student Performance Standards

Course Title: **Automation and Production Technology 1**
Course Number: **9200110**
Course Credit: **1**

Course Description:

This course includes instruction in the fundamentals of automation, manufacturing, and engineering technologies.

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Automation and Production Technology.		
	01.01 Key Ideas and Details		
	01.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
	01.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
	01.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
	01.02 Craft and Structure		
	01.02.1	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
	01.02.2	Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Automation and Production Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
04.0 Demonstrate an understanding of the core concepts of technology--The student will be able to:		SC.912.N.1.1	
04.01 Illustrate the nature and development of technological knowledge and processes.			
04.02 Discuss and evaluate current technological developments that are/were driven by profit motive and the market.			
04.03 Identify new technologies that create new processes.			
04.04 Identify the criteria and constraints of a product or system and determine how they affect the final design and development.			
04.05 Identify and compare resources involving trade-offs between competing values, such as availability, cost, desirability, and waste.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
04.06	Apply systems thinking logic and creativity with appropriate compromises in complex real-life problems			
04.07	Define a management system as the process of planning, organizing, and controlling work.			
04.08	Assess technological systems, which are the building blocks of technology and are embedded within larger technological, social, and environmental systems.			
04.09	Outline complex systems that have many layers of controls and feedback loops to provide information.			
04.10	Explain technological innovation resulting when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields			
05.0	Demonstrate an understanding of the influence of technology on history as well as its cultural, social, economic, and political effects--The student will be able to:		SC.912.N.4.1	
05.01	Discuss the history of technology as a powerful force in reshaping the social, cultural, political, and economic landscape.			
05.02	Define the following "Ages" to show the progression and their impact on society: Iron Age, Middle Ages, Renaissance, Industrial Revolution, and the Information Age.			
05.03	Assess how the evolution of civilization has been directly affected by, and has in turn affected, the development and use of tools and materials.			
05.04	List trade-offs of developing technologies to reduce the use of resources.			
05.05	Identify and discuss ethical considerations important in the development, selection, and use of technologies.			
05.06	Select technologies to conserve water, soil, and energy through such techniques as reusing, reducing and recycling.			
05.07	Compare and contrast the alignment of technological processes with natural processes to maximize performance and reduce negative impacts on the environment.			
05.08	Identify and assess technologies devised to reduce the negative consequences of other technologies.			
05.09	Make decisions about the implementation of technologies involving the weighing of trade-offs between predicted positive and negative effects on the environment.			
06.0	Demonstrate an understanding of the attributes of engineering design--	MAFS.912.N-Q.1.3	SC.912.N.1.1, 7	

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
	The student will be able to:			
06.01	Describe the design process; including defining a problem, brainstorming, researching and generating ideas, identifying criteria and specifying constraints, exploring possibilities, selecting an approach, developing a design proposal, making a model or prototype, testing and evaluating the design using specifications, refining the design, creating or making it, and communicating processes and results.			
06.02	Restate design problems that are seldom presented in a clearly defined form.			
06.03	Check and critique a design, and improve and revise the idea of the design as needed.			
06.04	Analyze competing requirements of a design, such as criteria, constraints, and efficiency.			
06.05	Identify design principles to include, but not limited to, Design for Manufacturing (DFM) used to evaluate existing designs, to collect data, and to guide the design process.			
06.06	Evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.			
06.07	Describe the influence of personal characteristics, such as creativity, resourcefulness, and the ability to visualize and think abstractly on the Engineering Design process.			
06.08	Apply the design process to construct a prototype or a working model used to test a design concept by making actual observations and necessary adjustments.			
07.0	Demonstrate an understanding of employability skills and career opportunities in the fields of advanced manufacturing and engineering technologies--The student will be able to:			
07.01	Demonstrate knowledge of good workplace behavior and how to address improper workplace behavior.			
07.02	Discuss motivation and human behavior.			
07.03	Develop a personal stress management plan.			
07.04	Demonstrate knowledge of ways to improve reading, listening and writing skills.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
07.05	Demonstrate knowledge of techniques for making effective presentations to internal and external customers.			
07.06	Use different forms of communication, such as e-mail, fax and phones.			
07.07	Provide effective feedback and make suggestions.			
07.08	Demonstrate appropriate customer service skills and techniques.			
07.09	Explain the characteristics of a high-performance team and how to assess team member personality types.			
07.10	Engage in team activities such as a team icebreaker exercise, developing a team constitution, brainstorming session, and reaching a decision by consensus.			
07.11	Demonstrate knowledge of roles and responsibilities of production team members.			
07.12	Align team goals (that are specific, documented, measurable and achievable) to customer and business production needs.			
07.13	Communicate production and process information to team members.			
07.14	Organize a team to: construct and analyze a flow chart, construct a fishbone diagram, use a criteria screen to make a decision, use an impact/effort grid to make a decision, use multi-voting to make a decision, manually construct a Pareto chart.			
08.0	Demonstrate an understanding of workplace safety and workplace organization--The student will be able to:			
08.01	Locate and use Material Safety Data Sheets (MSDS).			
08.02	Demonstrate knowledge of first aid or first response procedures.			
08.03	Identify safety procedures in case of smoke or chemical inhalation.			
08.04	Demonstrate knowledge of material handling techniques to safely move materials.			
08.05	Demonstrate the proper techniques for lifting loads.			
08.06	Demonstrate knowledge of safety requirements for material handling equipment such as forklifts, cranes, rigging, and pry trucks.			
08.07	Demonstrate knowledge of safety requirements for platforms, manlifts, and ladders.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
08.08	Proactively respond to a safety concern and then document occurrences.			
08.09	Demonstrate knowledge of emergency exits and signage.			
08.10	Demonstrate knowledge of various emergency alarms and procedures			
08.11	Perform emergency drills and participate in emergency teams.			
08.12	Demonstrate knowledge of clean-up procedures for spills.			
08.13	Explain Lock Out/Tag Out requirements and procedures.			
08.14	Demonstrate knowledge of machinery and equipment safety functions to determine if all safeguards are operational.			
08.15	Identify procedures for handling hazardous material.			
08.16	Develop safety checklists.			
08.17	Identify and report unsafe conditions.			
08.18	Determine the appropriate corrective action after an unsafe condition is identified.			
08.19	Demonstrate knowledge of safety requirements for manual, electrical-powered, and pneumatic tools.			
08.20	Demonstrate knowledge of safety requirements for operation of automated machines.			
08.21	Perform safety and environmental inspections.			
08.22	Skill in performing leak checks to determine if toxic or hazardous material is escaping from a piece of equipment.			
08.23	Demonstrate knowledge of proper and safe installation techniques as described in manuals, checklists, and regulations.			
08.24	Demonstrate knowledge of equipment shutdown procedures.			
08.25	Identify-safety related maintenance procedures.			
08.26	Selecting and use personal protective equipment (PPE).			
08.27	Explain the safety benefits of 6S work environment.			
08.28	Demonstrate knowledge of ergonomic impact of work techniques.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
08.29 Train other personnel to use equipment safely.			
09.0 Demonstrate an understanding of mechanisms--The student will be able to:		SC.912.P.10.2 SC.912.P.12.1,2,3,4	
Levers and Linkages			
09.01 For the relation (m, w) calculate the weights (range) of objects given mass (domain) of objects.			
09.02 Calculate the compression rate of a spring using Hooke's Law.			
09.03 Use a spring scale to measure the weight of an object and the force on an object.			
09.04 Calculate torque given an application.			
09.05 Calculate the moment caused by a force.			
09.06 Calculate and measure the mechanical advantage of a first-class, second-class, and third-class lever.			
09.07 Calculate the coefficient of friction given application data.			
09.08 Measure the force required to overcome friction in different applications.			
09.09 Calculate and measure the mechanical advantage of an inclined plane.			
09.10 Connect and operate a slider crank linkage.			
09.11 Connect and operate a double rocker linkage.			
09.12 Connect and operate a crank rocker linkage.			
09.13 Connect and operate a cam and cam follower.			
09.14 Measure the velocity and dwell of a cam.			
09.15 Connect and operate a turnbuckle.			
Power Transmission Systems			
09.16 Use a spirit level to determine orientation of a surface.			
09.17 Select a fastener size and type for a motor mount and correct for a soft foot condition.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
09.18 Level an electric motor.			
09.19 Select a key size for a given application.			
09.20 Measure the actual size of a key and keyseat given a sample.			
09.21 Assemble a hub to a shaft using a key fastener.			
09.22 Use a digital tachometer to measure motor speed.			
09.23 Use a prony brake to measure shaft torque.			
09.24 Calculate rotary mechanical power.			
09.25 Identify shaft size given a sample.			
09.26 Install and adjust a pillow block antifriction bearing and shaft.			
09.27 Install a flexible jaw coupling.			
09.28 Align two shafts using a straight edge and feeler gage.			
Pulley Systems and Gear Drives			
09.29 Measure the mechanical advantage of a fixed pulley.			
09.30 Measure the mechanical advantage of a movable pulley.			
09.31 Calculate and measure the mechanical advantage of a pulley combination.			
09.32 Connect and operate a gear drive system.			
09.33 Calculate and measure the mechanical advantage of a gear drive.			
V-belt Drives			
09.34 Calculate pulley ratio.			
09.35 Calculate the shaft speed and torque of a belt drive system.			
09.36 Install and align a fractional HP V-belt drive with a finished bore.			
09.37 Determine the belt deflection force for a given application.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
09.38 Adjust belt tension using an adjustable mounting base.			
09.39 Use a belt tension tester to measure belt tension.			
Chain Drives			
09.40 Calculate sprocket ratio.			
09.41 Calculate the shaft speed and torque of a chain drive system.			
09.42 Install and align a roller chain drive system with adjustable centers.			
09.43 Determine allowable chain sag for a given application.			
09.44 Use a rule and a straight edge to measure chain sag.			
09.45 Adjust chain sag to a specified amount using adjustable centers.			
09.46 Install and remove a chain with a master link.			

Florida Department of Education
Student Performance Standards

Course Title: **Automation and Production Technology 2**
Course Number: **9200120**
Course Credit: **1**

Course Description:

This course includes instruction in the fundamentals of automation, manufacturing, and engineering technologies

Florida Standards			Correlation to CTE Program Standard #
01.0	Methods and strategies for using Florida Standards for grades 09-10 reading in Technical Subjects for student success in Automation and Production Technology.		
01.01	Key Ideas and Details		
01.01.1		Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions. LAFS.910.RST.1.1	
01.01.2		Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.910.RST.1.2	
01.01.3		Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.910.RST.1.3	
01.02	Craft and Structure		
01.02.1		Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics. LAFS.910.RST.2.4	
01.02.2		Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy). LAFS.910.RST.2.5	

Florida Standards			Correlation to CTE Program Standard #
	01.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, defining the question the author seeks to address. LAFS.910.RST.2.6	
01.03	Integration of Knowledge and Ideas		
	01.03.1	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words. LAFS.910.RST.3.7	
	01.03.2	Assess the extent to which the reasoning and evidence in a text support the author's claim or a recommendation for solving a scientific or technical problem. LAFS.910.RST.3.8	
	01.03.3	Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts. LAFS.910.RST.3.9	
01.04	Range of Reading and Level of Text Complexity		
	01.04.1	By the end of grade 9, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 9–10 text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	01.04.2	By the end of grade 10, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 9–10 text complexity band independently and proficiently. LAFS.910.RST.4.10	
02.0	Methods and strategies for using Florida Standards for grades 09-10 writing in Technical Subjects for student success in Automation and Production Technology.		
02.01	Text Types and Purposes		
	02.01.1	Write arguments focused on discipline-specific content. LAFS.910.WHST.1.1	
	02.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.910.WHST.1.2	
	02.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.910.WHST.1.3	

Florida Standards			Correlation to CTE Program Standard #
02.02	Production and Distribution of Writing		
	02.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.910.WHST.2.4	
	02.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.910.WHST.2.5	
	02.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically. LAFS.910.WHST.2.6	
02.03	Research to Build and Present Knowledge		
	02.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.910.WHST.3.7	
	02.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation. LAFS.910.WHST.3.8	
	02.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.910.WHST.3.9	
02.04	Range of Writing		
	02.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.910.WHST.4.10	
03.0	Methods and strategies for using Florida Standards for grades 09-10 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.		

Florida Standards	Correlation to CTE Program Standard #
03.01 Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1	
03.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
03.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
03.04 Model with mathematics. MAFS.K12.MP.4.1	
03.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
03.06 Attend to precision. MAFS.K12.MP.6.1	
03.07 Look for and make use of structure. MAFS.K12.MP.7.1	
03.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
10.0 Demonstrate an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving--The student will be able to:		SC.912.N.1.1	
10.01 Define research and development as a specific problem solving approach that is used intensively in business and industry to prepare devices and systems for the marketplace.			
10.02 Conduct research and development to prepare a prototype devices, product or systems for the marketplace.			
10.03 Identify and conduct research needed to solve technological problems.			
10.04 Differentiate between technological and non-technological problems, and identify which problems can be solved using technology.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
10.05	Utilize a multidisciplinary approach to solving technological problems.			
11.0	Demonstrate an understanding of thermal technology--The student will be able to:		SC.912.P.10.2, 4, 5; SC.912.P.12.10	
11.01	Measure temperature and convert between temperature scales.			
11.02	Calculate the change in length of a material given a change in temperature using the slope intercept and standard form of the equation expression this relationship.			
11.03	Calculate the change in volume of a material given a temperature change.			
11.04	Convert between Energy units.			
11.05	Calculate the change in internal energy of a substance given its temperature change.			
11.06	Calculate gas properties using the Ideal Gas Law.			
11.07	Determine the effectiveness of an insulation system.			
11.08	Analyze a system using the first law of thermodynamics.			
11.09	Measure the relative humidity and calculate the dew point of the air.			
12.0	Demonstrate an understanding of communication and workplace computer skills--The student will be able to:			
12.01	Write logical and understandable statements, or phrases, to accurately complete forms commonly used in business and industry.			
12.02	Read and understand graphs, charts, diagrams, and common table formats.			
12.03	Read and follow written instructions.			
12.04	Demonstrate knowledge of technical language and technical acronyms.			
12.05	Use a spreadsheet application to open, view, enter, and format data.			
12.06	Create formulas in a spreadsheet application to manipulate data.			
12.07	Create a chart in a spreadsheet application to represent linear and quadratic equations.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
12.08	Use a sword processing application to open, view, create and save a new document.			
12.09	Create a writing sample such as a business letter, memo, or technical report.			
12.10	Create a presentation outline.			
12.11	Create and deliver a short presentation using a presentation application.			
12.12	Use a browser to go to and navigate a Web site.			
12.13	Download a file from a Web site.			
12.14	Use E-mail to send and receive a message with attachments.			
12.15	Use an internet search engine to research a topic.			
13.0	Demonstrate the ability to read and accurately interpret blueprints and schematics–The student will be able to:			
13.01	Define basic blueprint terminology such as title block, border, views, notes, revision blocks, etc. In addition, the individual will recognize the intent of the drawing and its use in manufacturing.			
13.02	Differentiate between dimensions of location and size. These dimensions may be represented as ordinate, base line, tabular, etc.			
13.03	Interpret Linear, Circular, and Angular dimension features on a print.			
13.04	Identify general note symbols and their applications within a manufacturing environment. Examples of symbols include finishing requirements, material specifications, machining/manufacturing specifications, assembly symbols, ANSI symbols, ISO symbols, etc.			
13.05	Locate notes on a print using industry standards, using three drawings with two minutes per note and 100% accuracy.			
13.06	Interpret commonly used abbreviations and terminology used on prints in the manufacturing environment.			
13.07	Determine tolerances associated with dimensions on a drawing.			
13.08	Determine if a part dimension is within tolerance using conventional tolerancing.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
13.09	Calculate the limits of a dimension given its tolerance.			
13.10	Determine a dimension of an object given an undimensioned scaled drawing.			
13.11	Identify types of lines within a drawing. Examples include hidden lines, object lines, extension lines, and section lines. Individuals should read various drawings and identify lines with 100% accuracy.			
13.12	Interpret the following information from a blueprint title block: company name, part name and number, material, name of designer and checker, revision history, and other important information regarding the part.			
13.13	Recognize the changes through which the design has progressed from the original design. Interpret the meaning of the revision block symbols and notations. Match the revision block components with the actual drawing features.			
13.14	Check for revisions. Given a series of drawings, some of which contain revisions and proper notation, properly identify which ones are the most current revisions, and identify which drawings do not contain revisions.			
13.15	Identify orthographic views. Recognize the three basic views which may be represented on the drawing; front, top, right side. Identify if the print is drawn in first or third angle projection. Detect features represented in one view and find those same features in another view.			
13.16	Identify isometric views. On a drawing containing orthographic and isometric, properly identify the isometric view.			
13.17	Identify positions of views: top, front, side, auxiliary, and section. Given an orthographic drawing, identify all appropriate views according to their position or placement on print. Or, given an actual part, the individual will be able to match the views to the appropriate surfaces.			
13.18	Determine the scale of the view or section. Based on the title block information, physical scaling of view, and standard drawing scale, determine appropriate scale of view or section.			
13.19	Identify the size and type of fasteners used in an assembly drawing.			
14.0	Demonstrate proficiency in the use of quality assurance methods and quality control concepts–The student will be able to:	MAFS.912.S-IC.2		

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
14.01	Demonstrate knowledge of quality systems such as Statistical Process Control (SPC), Six Sigma, Total Quality Management (TQM), and International Standards Organization (ISO) 9000.			
14.02	Selecting and use quality systems to identify problems and record quality issues.			
14.03	Demonstrate knowledge of statistics for making accurate decisions about quality data.			
14.04	Demonstrate knowledge of various statistical quality tools such as histograms, Cpk, X bar and R charts, and range.			
14.05	Create control charts (e.g., variables and attributes) using linear relationships and properties of parallel lines.			
14.06	Record and analyze quality issues in the production process, using tools such as Root Cause Failure Analyses (RCFA).			
14.07	Use Pareto analysis to identify priorities for solving multiple sub–standard product problems.			
14.08	Determining accuracy and precision when using measuring equipment.			
14.09	Demonstrate knowledge of performance indicators that can be readily understood by operators.			
14.10	Demonstrate knowledge of how to use inspection tools, equipment and procedures.			
14.11	Use and convert both U.S. measurement and standard international metric systems using precision measurement tools such as: a machinist's rule, tape measure, caliper, micrometer, digital gage, pH meter, and thermometer.			
14.12	Demonstrate knowledge of inspection equipment calibration standards and requirements.			
14.13	Verify calibration of inspection equipment.			
14.14	Demonstrate knowledge of appropriate automated inspection system.			
14.15	Demonstrate knowledge of maintaining and storing inspection tools.			
14.16	Develop records on quality process which are maintained to appropriate standards.			
14.17	Chart outcomes of quality processes according to appropriate methods and standards.			
14.18	Demonstrate knowledge of the importance of accurate and precise data for quality process performance.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
14.19	Analyze quality process performance data to identify trends.			
14.20	Report quality process performance data to appropriate parties in a timely manner.			
14.21	Identify/report performance and training issues affecting quality.			
14.22	Examine previous documentation on similar process issues to identify possible solutions.			
14.23	Recommend actions that are clear, concise and supported by data.			
14.24	Identify follow-up activities that indicate that corrective action was taken.			
14.25	Document product quality following corrective action and identify documentation and records transmittal required for customers.			
14.26	Identify the circumstances for prompt corrective actions related to product quality or the health or safety of workers.			
14.27	Determine disposition of sub-standard product.			
14.28	Implement closed-loop corrective action follow-up: spot checks, quality documentation, and an audit to optimize the outcomes of the corrective steps.			
14.29	Describe and explain the concepts of Lean Manufacturing.			
14.30	Identify and apply value stream mapping, just-in-time procedures, and techniques of continual improvement.			
14.31	Describe the changes necessary in implementing waste-free manufacturing (WFM) in a lean environment.			
14.32	Describe and explain supply chain management.			
14.33	Describe and explain the use of the 6S's, (sort, set in order, shine, standardize, sustain, safety).			
15.0	Demonstrate an understanding of modern business practices and enterprise systems--The student will be able to:			
15.01	Use the Internet to find economic statistics.			
15.02	Use the Internet to find commodity price data.			
15.03	Use a spreadsheet application to analyze economic data.			
15.04	Select materials and process for a product using cost as a factor.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
15.05 Interpret a Bill of Materials.			
15.06 Create a Bill of Materials for a product given a sample.			
15.07 Use a spreadsheet to create a bill of materials for a product.			
15.08 Demonstrate knowledge of the alignment of a company's business objectives with production goals.			
15.09 Describe the importance of entrepreneurship to the American economy.			
15.10 Identify the necessary personal characteristics of a successful entrepreneur.			
15.11 Identify the business skills needed to operate a small business efficiently and effectively.			
15.12 Identify the key elements of a business plan and apply them in the creation of a business plan.			
15.13 Evaluate and justify decisions based on ethical reasoning.			
15.14 Identify and explain personal and organizational consequences of unethical or illegal behaviors in the workplace.			
15.15 Interpret and explain written organizational policies and procedures.			

Florida Department of Education
Student Performance Standards

Course Title: **Automation and Production Technology 3**
Course Number: **9200130**
Course Credit: **1**

Course Description:

This course includes instruction in the fundamentals of automation, manufacturing, and engineering technologies.

Florida Standards			Correlation to CTE Program Standard #
16.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Automation and Production Technology.		
	16.01 Key Ideas and Details		
	16.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	16.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	16.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	16.02 Craft and Structure		
	16.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	16.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	16.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
16.03	Integration of Knowledge and Ideas		
	16.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	16.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	16.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
16.04	Range of Reading and Level of Text Complexity		
	16.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	16.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Automation and Production Technology.		
17.01	Text Types and Purposes		
	17.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	17.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	17.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
17.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	17.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	17.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	17.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
17.03	Research to Build and Present Knowledge		
	17.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	17.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	17.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
17.04	Range of Writing		
	17.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
18.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.		
18.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
18.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
18.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
18.04 Model with mathematics. MAFS.K12.MP.4.1	
18.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
18.06 Attend to precision. MAFS.K12.MP.6.1	
18.07 Look for and make use of structure. MAFS.K12.MP.7.1	
18.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
19.0 Demonstrate an understanding of graphic design by generating and interpreting computer-aided drawings--The student will be able to:			
19.01 Create a sketch of an object.			
19.02 Sketch a multiview drawing with dimensions given an isometric drawing.			
19.03 Select the front view of an object.			
19.04 Use a CAD System to open and change the views of CAD drawings.			
19.05 Use a CAD system to identify points in Absolute, Relative, and Polar coordinates.			
19.06 Use standard CAD commands (such as Grid, Snap, Array, Erase, Trim Break, Hatch) in the editing of a drawing.			
19.07 Create a drawing with a title block using CAD drawing commands.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
19.08	Plot (Print) a CAD System drawing to a specific scale.			
19.09	Use CAD software to create a single view drawing.			
19.10	Use CAD software to create a multiview drawing.			
19.11	Use CAD software to dimension a drawing.			
19.12	Print a CAD drawing to a specific scale.			
19.13	Use a CAD system to create an electrical schematic of a process.			
19.14	Use a CAD system to create a piping schematic of a process.			
19.15	Use a CAD system to create a schematic symbol library.			
19.16	Use CAD to create a full sectional view for an object.			
19.17	Use CAD to create a bent sectional view for an object.			
19.18	Use CAD to create an offset sectional view for an object.			
19.19	Sketch an internal thread using the simplified method of thread representation.			
19.20	Sketch an external thread using the simplified method of thread representation.			
19.21	Use a CAD system to draw a thread representation.			
19.22	Use the UCS command to create a custom 3D coordinate system orientation.			
19.23	Create a 3D object using 3D drawing commands.			
19.24	Open and change the view of a solid model.			
19.25	Add features (such as: extruded cut, fillet, chamfer, revolved boss/base, revolved cut) to a solid model.			
20.0	Demonstrate proficiency in using measurement tools, instruments and testing devices related to proper quality assurance methods--The student will be able to:			
20.01	Use appropriate measurement tools such as: machinist's rule, tape measure, caliper, digital caliper, outside micrometer, and dial indicator.			
20.02	Convert between common fraction inches and decimal inches.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
20.03	Calibrate a dial caliper.			
20.04	Master a dial indicator.			
20.05	Implement appropriate testing regimes.			
20.06	Use appropriate safety monitoring and testing equipment.			
20.07	Use multi-gauging to inspect, verify, and document whether product dimensions meet customer requirements.			
20.08	Research measurement tools for non-mechanical systems and products. (i.e. pH, °Brix)			
21.0	Demonstrate a fundamental understanding of AC/DC electrical and electrical control--The student will be able to:		SC.912.P.10.13,14, 15	
21.01	Demonstrate knowledge of AC/DC theory.			
21.02	Check electrical components for UL and CSA approval.			
21.03	Use an AC tester to check a wall outlet for electricity.			
21.04	Use appropriate grounding techniques.			
21.05	Connect and operate a power supply.			
21.06	Connect and operate a circuit using some combination of the following elements: three types of manual switches, a resistor, a buzzer, a solenoid, a motor.			
21.07	Use a Digital Multi-Meter (DMM) to measure the voltage of a point referenced to ground, voltage drops in series and parallel circuits, electrical current, current in series and parallel circuits, resistance of a component, resistance in series and parallel circuits, and test the continuity of wires.			
21.08	Calculate series resistance given each load's resistance.			
21.09	Use Ohm's Law to calculate voltage, current, and resistance in a series circuit.			
21.10	Calculate the total power used by a series circuit.			
21.11	Calculate the main line current in a parallel circuit.			
21.12	Calculate the total parallel resistance.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
21.13 Calculate the total power used in a parallel circuit.			
21.14 Operate a circuit using a fuse, test and replace a fuse.			
21.15 Operate a circuit using a circuit breaker, test and reset a circuit breaker.			
21.16 Connect and operate a relay in a circuit.			
21.17 Calculate the total load on an AC circuit with inductors.			
21.18 Discharge a capacitor.			
21.19 Test a capacitor with a DMM.			
21.20 Measure the voltage across a charged capacitor.			
21.21 Calculate the total load on an AC circuit with capacitors.			
21.22 Calculate the time to charge and discharge a capacitor.			
21.23 Trace the current path in a combination circuit.			
21.24 Solve a combination circuit.			
21.25 Connect and operate a basic lighting circuit, a ceiling fan circuit, and a rheostat as a light dimmer.			
21.26 Design, connect, and operate a voltage divider network.			
21.27 Locate a short circuit and an open circuit.			
21.28 Size, connect, and operate a transformer.			
21.29 Calculate the secondary coil voltage of a transformer.			
21.30 Troubleshoot a transformer by measuring continuity.			
21.31 Calculate the current load on a transformer.			
21.32 Design a control transformer circuit to provide a given output voltage.			
21.33 Read and interpret the operation of a circuit given a ladder diagram.			
21.34 Connect and operate a logic circuit given a ladder diagram.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
21.35 Design a ladder diagram using one or more logic elements.			
21.36 Design, connect, and operate a control circuit to operate a solenoid valve.			
21.37 Read and interpret a basic ladder diagram with detached symbology.			
21.38 Design, connect, and operate a relay to energize a fluid power solenoid.			
21.39 Connect and operate a relay to perform a seal-in function.			
21.40 Connect and operate an event sequencing circuit given a ladder diagram.			
21.41 Design a logic circuit that uses a limit switch to sequence an event.			
21.42 Connect and operate a single-cycle cylinder reciprocation circuit.			
21.43 Connect and operate a continuous-cycle cylinder reciprocation circuit.			
21.44 Design a continuous-cycle cylinder reciprocation circuit with a safety interlock.			
21.45 Connect and operate a control circuit with a timer relay.			
21.46 Connect and operate a control circuit to perform an unloaded start of a motor.			
21.47 Design a control circuit to perform time-driven sequencing.			
21.48 Connect and operate a dual-cylinder control circuit using two limit switches.			
21.49 Design a continuous-cycle multiple-cylinder circuit.			
21.50 Connect and operate a circuit having both automatic and manual modes of operation.			
21.51 Connect and operate a control circuit to simulate a two-pushbutton jog circuit.			
22.0 Demonstrate an understanding of fluid power--The student will be able to:		SC.912.P.10.3; SC.912.P.12.3, 10	
Pneumatic circuits and power systems			
22.01 Identify pneumatic symbols.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
22.02 Read a pneumatic pressure gage and flow meter.			
22.03 Calculate the extension force of a cylinder given its size and pressure.			
22.04 Determine the pressure needed to create a known output force on an extending cylinder.			
22.05 Measure the force output of an extending cylinder.			
22.06 Calculate the retraction force of a cylinder given its size and pressure.			
22.07 Convert between gage and absolute pressures.			
22.08 Use Boyle's Law to calculate changes in pressure and volume.			
22.09 Convert air volumes at pressures to free air volumes.			
22.10 Measure pressure drop (Delta P) across pneumatic components.			
22.11 Connect equipment and perform basic pneumatic operations such as: adjust a pressure regulator, drain a pneumatic filter, uses quick-connect fittings, use a tee to connect two circuit branches together, use a cross to connect three circuit branches together, operate a check valve.			
22.12 Connect a pneumatic circuit given a schematic.			
22.13 Draw a pneumatic schematic from the actual circuit connections on the machine.			
22.14 Design a multiple actuator pneumatic circuit.			
22.15 Connect pneumatic speed control circuits to: operate a needle valve to control actuator speed, operate a flow control valve to control actuator speed, operate a meter-in flow control circuit, operate a meter-out flow control circuit, operate an exhaust port speed control circuit, and operate a pressure port speed control circuit.			
22.16 Design speed control circuits.			
22.17 Connect and utilize Pneumatic DCV applications such as: a pneumatic cam-operated 4/2 DCV, a pneumatic cam-operated 3/2 DCV, a single-acting pneumatic cylinder using a 3-way manually-operated DCV, a double-acting pneumatic cylinder			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
using a 3-way manually-operated DCV, a unidirectional pneumatic motor using a 3-way manually-operated DCV, a two-way valve, a cylinder deceleration circuit using power braking, and an externally air-piloted DCV using the manual override.			
22.18 Design a rapid traverse-slow feed pneumatic circuit.			
22.19 Design a pneumatic circuit to sequence two cylinders.			
22.20 Design a pneumatic circuit that uses an externally air-piloted DCV.			
Vacuum Systems			
22.21 Convert between units of mercury and units of air pressure.			
22.22 Connect and read a vacuum gage and manometer.			
22.23 Convert between units of water column and units of water pressure.			
22.24 Connect and operate a vacuum generator.			
22.25 Calculate vacuum cup lift force.			
22.26 Connect and operate a vacuum cup.			
22.27 Design the vacuum cup portion of a handling rack.			
Hydraulic Circuits and Power Systems			
22.28 Read a hydraulic pressure gage, flow meter and the liquid level and temperature in the reservoir.			
22.29 Calculate the extension force of a cylinder given its size and pressure.			
22.30 Measure the force output of an extending cylinder.			
22.31 Calculate the retraction force of a cylinder given its size and pressure.			
22.32 Measure the force output of a retracting cylinder.			
22.33 Measure the pressure drop (Delta P) across a hydraulic component.			
22.34 Convert between absolute pressure and gage hydraulic pressure.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
22.35 Calculate the extend speed, retract speed, and cylinder stroke time of a hydraulic cylinder given its size and a flow rate.			
22.36 Draw a hydraulic schematic from the actual circuit connections on a pictorial.			
22.37 Draw a hydraulic circuit given a schematic.			
22.38 Operate a hydraulic power unit.			
22.39 Connect equipment and perform basic hydraulic operations such as: connect and disconnect a hydraulic hose that uses quick-connect fittings, use a tee to connect two circuit branches together, connect a flow meter, operate a needle valve to control the speed of an actuator, control the speed of an actuator using a manually-operated DCV, operate a bi-directional hydraulic motor using a 3-position manually-operated DCV, operate a double-acting hydraulic cylinder using a 3-position manually-operated DCV.			
22.40 Design and connect hydraulic speed control circuits to: limit pressure in the system with a relief valve, provide bypass flow, control speed of an actuator by adjusting a flow control valve, operate a meter-in flow control circuit, and operate a meter-out flow control circuit.			
22.41 Design a multiple actuator hydraulic circuit, an independent speed control circuit, and a two-speed actuator circuit.			
23.0 Demonstrate the abilities to use and maintain technological products and systems–The student will be able to:			
Overall Maintenance Process			
23.01 Discuss preventive and predictive maintenance methods for manufacturing environments.			
23.02 Demonstrate knowledge of principles of Total Productive Maintenance (TPM).			
23.03 Recognize potential maintenance issues with basic production systems and determine when to inform maintenance personnel about issues.			
23.04 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.			
23.05 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
23.06	Operate systems so that they function in the way they were designed.			
23.07	Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.			
23.08	Develop and follow maintenance schedules.			
23.09	Identify the most common causes of failure of equipment in order to diagnosis problem quickly.			
23.10	Demonstrate knowledge of what different equipment alarms indicate.			
23.11	Make on-process adjustments during production.			
23.12	Examine the concept of troubleshooting within basic manufacturing maintenance areas.			
23.13	Identify equipment failures in manufacturing maintenance areas.			
23.14	Describe root cause analysis methods.			
23.15	Use materials management to know what is recyclable and what is not.			
23.16	Use monitoring or diagnostic devices to find out when equipment is operating correctly.			
23.17	Use appropriate maintenance tools to maintain machines.			
Documentation of Maintenance				
23.18	Document processes and procedures and communicate them to different audiences using appropriate oral and written techniques.			
23.19	Demonstrate knowledge of the procedures for logging repairs and work order requests.			
23.20	Demonstrate knowledge of statistical method charts to ensure that equipment is producing a quality product.			
23.21	Demonstrate knowledge of forms and procedures for correctly documenting processes (e.g., preventative maintenance forms).			
23.22	Read diagrams, schematics, manuals and specifications to understand how to repair equipment.			
23.23	Document repairs, replacement parts, problems and corrective actions to maintain log to determine patterns of operation.			
23.24	Review maintenance log/checklist to ensure that recommended			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
preventative procedures are followed.			
Specific Maintenance Operations			
23.25 Demonstrate knowledge of proper and safe functioning of mechanical power transmission equipment. Specifically, the basic functions of bearings, shafts and couplings and how to recognize a malfunction.			
23.26 Demonstrate knowledge of lubrication procedures and requirements. Specifically, explain API Service Categories for lubricants; take and analyze oil samples; determine proper lubricants for various types of equipment; use grease guns for various types of lubrication, and demonstrate skill in safe storage and disposal of lubricants.			
23.27 Demonstrate knowledge of the selection, design, and safe functioning of belt, chain, and roller chain drive equipment.			
23.28 Demonstrate knowledge of fluid transport. Specifically, identify standard types of industrial pumps and determine the causes and maintenance procedures for: shaft seal failure, shaft misalignment, and pump cavitations.			

Florida Department of Education
Student Performance Standards

Course Title: **Automation and Production Technology 4**
Course Number: **9200140**
Course Credit: **1**

Course Description:

This course includes instruction in the fundamentals of automation, manufacturing, and engineering technologies.

Florida Standards			Correlation to CTE Program Standard #
16.0	Methods and strategies for using Florida Standards for grades 11-12 reading in Technical Subjects for student success in Automation and Production Technology.		
	16.01 Key Ideas and Details		
	16.01.1	Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. LAFS.1112.RST.1.1	
	16.01.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text. LAFS.1112.RST.1.2	
	16.01.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text. LAFS.1112.RST.1.3	
	16.02 Craft and Structure		
	16.02.1	Determine the meaning of symbols key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics. LAFS.1112.RST.2.4	
	16.02.2	Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas. LAFS.1112.RST.2.5	
	16.02.3	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain unresolved. LAFS.1112.RST.2.6	

Florida Standards			Correlation to CTE Program Standard #
16.03	Integration of Knowledge and Ideas		
	16.03.1	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g. quantitative data, video, multimedia) in order to address a question or solve a problem. LAFS.1112.RST.3.7	
	16.03.2	Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. LAFS.1112.RST.3.8	
	16.03.3	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible. LAFS.1112.RST.3.9	
16.04	Range of Reading and Level of Text Complexity		
	16.04.1	By the end of grade 11, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] in the grades 11–CCR text complexity band proficiently, with scaffolding as needed at the high end of the range.	
	16.04.2	By the end of grade 12, read and comprehend literature [informational texts, history/social studies texts, science/technical texts] at the high end of the grades 11–CCR text complexity band independently and proficiently. LAFS.1112.RST.4.10	
17.0	Methods and strategies for using Florida Standards for grades 11-12 writing in Technical Subjects for student success in Automation and Production Technology.		
17.01	Text Types and Purposes		
	17.01.1	Write arguments focused on discipline-specific content. LAFS.1112.WHST.1.1	
	17.01.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes. LAFS.1112.WHST.1.2	
	17.01.3	Write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results. LAFS.1112.WHST.1.3	
17.02	Production and Distribution of Writing		

Florida Standards			Correlation to CTE Program Standard #
	17.02.1	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. LAFS.1112.WHST.2.4	
	17.02.2	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience. LAFS.1112.WHST.2.5	
	17.02.3	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. LAFS.1112.WHST.2.6	
17.03	Research to Build and Present Knowledge		
	17.03.1	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation. LAFS.1112.WHST.3.7	
	17.03.2	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation. LAFS.1112.WHST.3.8	
	17.03.3	Draw evidence from informational texts to support analysis, reflection, and research. LAFS.1112.WHST.3.9	
17.04	Range of Writing		
	17.04.1	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences. LAFS.1112.WHST.4.10	
18.0	Methods and strategies for using Florida Standards for grades 11-12 Mathematical Practices in Technical Subjects for student success in Automation and Production Technology.		
18.01	Make sense of problems and persevere in solving them. MAFS.K12.MP.1.1		

Florida Standards	Correlation to CTE Program Standard #
18.02 Reason abstractly and quantitatively. MAFS.K12.MP.2.1	
18.03 Construct viable arguments and critique the reasoning of others. MAFS.K12.MP.3.1	
18.04 Model with mathematics. MAFS.K12.MP.4.1	
18.05 Use appropriate tools strategically. MAFS.K12.MP.5.1	
18.06 Attend to precision. MAFS.K12.MP.6.1	
18.07 Look for and make use of structure. MAFS.K12.MP.7.1	
18.08 Look for and express regularity in repeated reasoning. MAFS.K12.MP.8.1	

Abbreviations:
FS-M/LA = Florida Standards for Math/Language Arts
NGSSS-Sci = Next Generation Sunshine State Standards for Science

Note: This course is pending alignment in the following categories: FS-M/LA, NGSSS-Sci., and National Standards

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
24.0 Demonstrate an understanding of and be able to select production processes--The student will be able to:			
24.01 Identify the production characteristics of manufacturing's subindustries: Chemical, Computers and Electronics Products, Electrical and Appliances, Food and Beverage, Furniture, Machinery, Nonmetallic Minerals, Petroleum and Coal, Plastics and Rubber, Primary and Fabricated Metals, Printing, Textile and Apparel, Transportation, and Wood and Paper.			
24.02 Identify customer needs.			
24.03 Determine resources available for the production process.			
24.04 Make job assignments and coordinate workflow.			
24.05 Communicate production and material requirements to meet product specifications.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
24.06 Establish set-up and operation procedures are available and up-to-date.			
24.07 Read and interpret a production schedule and manufacturing work order.			
24.08 Demonstrate knowledge of production process, including flow and bottlenecks.			
24.09 Document product and process compliance with customer requirements.			
25.0 Demonstrate an understanding of industrial tools and processes inclusive of: Basic Machine Tools, CNC machines, and Welding technology--The student will be able to:			
Introduction to Manufacturing Hand Tools			
25.01 Use a bench vise to hold material for a benchwork operation.			
25.02 Change a blade on a hacksaw.			
25.03 Cut a piece of stock to length using a hacksaw.			
25.04 Stamp letters in a part using a letter/number stamp set.			
25.05 Deburr a part using a file.			
25.06 Clean and store a file.			
25.07 Chamfer a part using a file.			
25.08 Square the ends of a part using a file.			
25.09 Create layout lines on round stock.			
25.10 Drill holes in round stock.			
Milling Processes			
25.11 Operate manual controls on a milling machine.			
25.12 Use a milling machine micrometer collar to measure table movement.			
25.13 Face a piece of stock to length.			
25.14 Mill a step using the micrometer collars on the milling machine.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
25.15 Mill a step on a part using layout lines.			
25.16 Mill a slot to a specific depth.			
25.17 Mill a pocket in a part.			
Band Saw Operation			
25.18 Determine the size of three common metal stock shapes: sheet, flat, round.			
25.19 Select stock size and type given a part drawing.			
25.20 Use a horizontal band saw to cut stock to a specified length.			
25.21 Use a vertical band saw to cut stock to a specified length.			
Drill Press Operations			
25.22 Use the prick punch, center punch, and ball-peen hammer to prepare holes for drilling.			
25.23 Determine the size of a drill.			
25.24 Select and change the spindle speeds of the floor drill press.			
25.25 Install a twist drill into a drill chuck.			
25.26 Mount a workpiece in a drill press vise.			
25.27 Drill holes using cutting fluid.			
25.28 Select a drill and drill a hole for reaming.			
25.29 Select a reamer and ream a hole.			
25.30 Drill a pilot hole to prepare a hole for countersinking.			
25.31 Select a countersink and countersink a hole.			
25.32 Drill the pilot hole for the counterboring operation.			
25.33 Select a counterbore and counterbore a hole.			
25.34 Select drill size and drill the holes for the tapping operation.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
25.35 Use a countersink to chamfer a hole.			
25.36 Select a tap and thread a hole using a tap and a tap wrench.			
CNC Mill Programming and Operation			
25.37 Enter and edit a CNC mill program using a text editor.			
25.38 Simulate and edit a CNC mill program.			
25.39 Determine the size and cutting direction of an end mill.			
25.40 Mount a tool in a CNC mill.			
25.41 Operate a CNC Mill.			
25.42 Determine CNC program coordinates based on a dimensioned part drawing.			
25.43 Select tooling for a CNC operation.			
25.44 Determine the spindle speed for various machining operations.			
25.45 Determine the feed rate for a machining operation.			
25.46 Locate the PRZ of a part in a CNC mill using an edgefinder.			
25.47 Determine the tool offsets in a CNC mill.			
25.48 Create a precision part using PRZ and tool offset measurements.			
25.49 Convert coordinates between absolute and incremental positioning methods.			
25.50 Interpret a CNC mill program that uses basic G- and M-Codes (G00-G03).			
25.51 Design a CNC programs that use: program stop command, linear interpolation, absolute and incremental positioning, circular interpolation, spot boring cycle, counterboring cycle, pecking cycle, boring cycle, cutter compensation, mirroring and subprograms.			
Welding			
25.52 Identify a specified weld using a welding symbol.			

CTE Standards and Benchmarks		FS-M/LA	NGSSS-Sci	National Standards
25.53	Draw a welding symbol using given variables.			
25.54	Demonstrate an understanding of the steps necessary to create a project from a welding drawing.			
25.55	Prepare metal for welding.			
25.56	Demonstrate an understanding of weld quality analysis using various testing procedures. i.e., dye penetrant, guided bend.			
25.57	Design a welded project.			
26.0	Demonstrate an understanding of computer aided manufacturing and flexible manufacturing planning and control--The student will be able to demonstrate:			
26.01	Skill in making job assignments and coordinating workflow.			
26.02	Skill in knowing that the appropriate resources are available to meet customer specifications and the roll of Enterprise Resource Planning (ERP) and Material Resource Planning (MRP) to accomplish this.			
26.03	Skill in ensuring that set-up and operation procedures are available and up-to-date.			
26.04	Skill in correctly reading and interpreting a production schedule and manufacturing work order.			
26.05	Knowledge of production process, including flow and bottlenecks.			
26.06	Knowledge of lead-time required for a production plan.			
26.07	Skill in correctly reading and interpreting bills of materials and routing sheets.			
26.08	Knowledge of methods of productivity measurement and improvement.			
26.09	Knowledge of principles and practice of Just-in-time (JIT) inventory control Skill in performing a physical inventory.			
26.10	Ability to identify manufacturing process variables that must be controlled for quality and reliability. This will include controlling quality of incoming materials, amounts of materials, operator skills, and adjustable parameters: time, temperature, pressure, speed, voltage, etc.			
27.0	Demonstrate proficiency in computer control and robotics--The student will be able to:			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
Programmable Logic Controllers (PLC)			
27.01 Demonstrate proficiently an understanding of Binary concepts.			
27.02 Wire input and output devices to a PLC.			
27.03 Open, download, monitor, run and stop a PLC processor file using PLC programming software.			
27.04 View the status of Input and Output Data Tables.			
27.05 Create, enter, save, and edit a PLC program using PLC programming software.			
27.06 Generate and print out a ladder logic report using PLC software.			
27.07 Design a PLC program to jog two motors.			
27.08 Design a PLC program to control the start/stop of two motors.			
27.09 Design a PLC program to interlock two motors.			
27.10 Design a PLC program that uses a safety interlock to control the operation of a machine.			
27.11 Design a reciprocating actuator sequence PLC program.			
27.12 Design a continuous cycle clamp and drill sequence PLC program.			
Basic Robot Operation			
27.13 Power up and shut down servo robot.			
27.14 Jog a servo robot and adjust the fast and slow jog speed settings.			
27.15 Move parts using the manual jog function.			
27.16 Home a servo robot.			
27.17 Manually operate the gripper using the teach pendant.			
27.18 Use a teach pendant to: teach robot position points, test teach points, and edit teach points.			
27.19 Use a teach pendant to delete a program file.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
27.20 Use a teach pendant to enter a servo robot program that uses standard commands such as: PMOVE, LABEL, BRANCH, GRASP, RELEASE, SPEED, and DELAY			
27.21 Run a servo robot program using a teach pendant.			
27.22 Stop a servo robot program using any one of four different functions on a teach pendant.			
27.23 Design a program to perform a basic material handling task.			
27.24 Store and retrieve multiple programs in a robot controller.			
27.25 Use PC software to enter and edit a robot program offline and online.			
27.26 Use PC software to delete a program.			
27.27 Use PC software to power up, jog, home, and power down a servo robot.			
27.28 Use PC software to run a servo robot program.			
27.29 Connect digital input and output devices to a robot controller.			
27.30 Use PC software to enter a program that has WAITI and WRITEO commands, uses a manual operator station, and will unload an automatic machine.			
27.31 Design a robot program that performs a basic assembly task using linear motion and the commands LMOVE and LINEAR.			
27.32 Enter a robot program that uses the World Coordinate motion commands.			
27.33 Design and enter a robot program that uses Tool Coordinate motion commands.			
Application Development and Flexible Manufacturing Cells			
27.34 Construct a flow chart given a general sequence of operations.			
27.35 Connect a solenoid-operated pneumatic valve to the output of a robot and operate.			
27.36 Design a robot program that will load and unload an automatic machine.			
27.37 Teach points with a double-jointed robot arm using the full range of its work envelope.			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
27.38 Design a robot program that uses a robot's double-jointed design.			
27.39 Design a robot program given a general description of the application.			
27.40 Connect and configure a servo conveyor to a servo robot.			
27.41 Enter a robot program that has MON and MOFF commands.			
27.42 Design a robot program that uses a conveyor.			
27.43 Enter a robot program that has conditional commands: IFIN, ELSE, ENDIF, IF-THEN, and INP.			
27.44 Design a robot program that sorts parts.			
27.45 Enter a robot program that has subroutine commands: CALL, RETURN, and SUB.			
27.46 Design a robot application using a subroutine.			
27.47 Enter a robot program that has a DDMOVE command.			
27.48 Design a robot program that uses a servo conveyor.			
27.49 Jog a robot using four joint modes.			
27.50 Program a robot that uses a servo traverse axis.			
27.51 Enter a robot program which uses the GRWIDTH command.			
27.52 Design a robot program that uses a servo gripper.			
27.53 Develop a robot-to-solid state I/O interface wiring diagram.			
27.54 Interface a robot discrete I/O using a relay.			
27.55 Design a robot program to control an FMS workstation via discrete I/O.			
27.56 Design a robot program that will unload two or more automatic machines.			
27.57 Design a robot program that encompasses the skills, techniques, and components in a flexible manufacturing system.			
Production Control			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
27.58 Enter a robot program that uses an input command.			
27.59 Enter a robot program that uses arithmetic and relational operators.			
27.60 Enter a robot program that has loop commands.			
27.61 Design a robot application using FOR-NEXT commands.			
27.62 Design and enter a robot program that uses counter commands.			
27.63 Design a robot program that stops a production process if a quality standard is not met.			
Quality Control			
27.64 View the current location of a robot in Cartesian coordinates.			
27.65 Use the MOV function with Cartesian coordinates to move a robot to a position.			
27.66 Use PC software to enter a robot program that uses points stored in Cartesian coordinates.			
27.67 Enter a robot program that has TESTI, FLAG, SET, RESET and IF FLAG commands.			
27.68 Design a robot program to perform a go no-go inspection.			
27.69 Enter a robot program that uses a variable name.			
27.70 Enter a robot program that uses the PRINT and PRINTLN commands.			
27.71 Design a program that provides an operator interface on a computer screen.			
27.72 Enter a robot program that has a MEASURE command.			
27.73 Design a robot program to inspect parts by measuring them in its gripper.			
28.0 Demonstrate the ability to properly identify, organize, plan, allocate resources, document and produce a mass-produced product via a master project--The student will be able to:			
28.01 Work in a team and use a seven step design process to design and build a prototype			
28.02 Create a Design Portfolio documenting research and student development materials including:			

CTE Standards and Benchmarks	FS-M/LA	NGSSS-Sci	National Standards
a. Operation and design description			
b. History research paper			
c. Current events article			
d. Individual contributor research paper			
e. Global industry analysis			
f. Local industry interview			
28.03 Create a Technology Sector Research Report containing four topics:			
a. Operation and application			
b. History and current events			
c. Impacts			
d. Individual and organization contribution			
28.04 Create an Industry Market Report that includes:			
a. Global market analysis			
b. Industry case study			
28.05 Create a Bill of Material (BOM) for your solution			
28.06 Create a prototype using specified design constraints (time, expenses, materials, safety considerations, etc.) and automated production processes			
28.07 Create and deliver a presentation to communicate project results to other teams			

Additional Information

Laboratory Activities

Laboratory investigations, including the use of scientific research, measurement, and laboratory technologies are an integral part of this course. These activities include instruction in the use of safety procedures, tools, equipment, materials, and processes related to these occupations. Equipment and supplies should be provided to enhance hands-on experiences for students.

Special Notes

The occupational standards and benchmarks outlined in this secondary program correlate to the standards and benchmarks of the postsecondary program with the same Classification of Instructional Programs (CIP) number.

Career and Technical Student Organization (CTSO)

SkillsUSA is the appropriate career and technical student organization for 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. The activities of such organizations are defined as part of the curriculum in accordance with Rule 6A-6.065, F.A.C.

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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities as identified on the secondary student's Individual Educational Plan (IEP) or 504 plan or postsecondary student's accommodations' plan 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.

In addition to accommodations, some secondary students with disabilities (students with an IEP served in Exceptional Student Education (ESE)) will need modifications to meet their needs. Modifications change the outcomes or what the student is expected to learn, e.g., modifying the curriculum of a secondary career and technical education course. Note: postsecondary curriculum and regulated secondary programs cannot be modified.

Some secondary students with disabilities (ESE) may need additional time (i.e., longer than the regular school year), to master the student performance standards associated with a regular Occupational Completion Point (OCP) or a Modified Occupational Completion Point (MOCP). If

needed, a student may enroll in the same career and technical course more than once. Documentation should be included in the IEP that clearly indicates that it is anticipated that the student may need an additional year to complete an OCP/MOCP. The student should work on different competencies and new applications of competencies each year toward completion of the OCP/MOCP. After achieving the competencies identified for the year, the student earns credit for the course. It is important to ensure that credits earned by students are reported accurately. The district's information system must be designed to accept multiple credits for the same course number for eligible students with disabilities.

Articulation

For details on articulation agreements which correlate to programs and industry certifications refer to http://www.fldoe.org/workforce/dwdframe/artic_frame.asp.

Bright Futures/Gold Seal Scholarship

Course substitutions as defined in the Comprehensive Course Table for this program area may be used to qualify a student for Florida's Gold Seal Vocational Scholarship, providing all other eligibility requirements are met. Eligibility requirements are available online at https://www.osfaffelp.org/bfiehs/fnbpcm02_CCTMain.aspx.

Fine Arts/Practical Arts Credit

Many courses in CTE programs meet the Fine Arts/Practical Arts credit for high school graduation (http://www.fldoe.org/articulation/CCD/files/pacourses1314.pdf). A listing of approved CTE courses is published each year as a supplemental resource to the Course Code Directory (http://www.fldoe.org/articulation/CCD/default.asp).

Equivalent Mathematics and Equally Rigorous Science Courses

Equally rigorous science courses are based upon levels of cognitive complexity of content specific benchmarks, depth and breadth of content focus, and required laboratory components.