Florida Department of Education
Curriculum Framework

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

AS	
CIP Number	1615000001
Program Type	College Credit
Program Length	60 credit hours
CTSO	SkillsUSA
SOC Codes (all applicable)	Please see the CIP to SOC Crosswalk located at the link below.
CTE Program Resources	http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml

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

This program is a planned sequence of instruction consisting of 60 credit hours.

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 design/drafting.
03.0 Demonstrate a fundamental understanding of electricity and electronics.
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 and identify career opportunities.

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

Note: Advanced Manufacturing Specialization has been daggered for deletion and will placed in teachout. Last year for enrollment 2026-27. This includes the 4 College Credit Certificates: Automation (0615040601), Lean Manufacturing (0615061302), Mechatronics (0615000013) and Pneumatics, Hydraulics and Motor for Manufacturing (0615061303).

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
CIP Numbers: **1615000001**
Program Length: **60 credit hours**

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	Explain current manufacturing processes to include modern trends (3-D printing, etc.).
01.02	Determine available and needed resources for the production process.
01.03	Describe the factors considered for design, maintenance, procurement and handling.
01.04	Analyze process changes for impact on product.
01.05	Identify principles and practices of production timing.
01.06	Identify effect of time, motion, and procedural changes on productivity.
01.07	Demonstrate the use of raw materials properties to meet requirements.
01.08	Follow engineering specifications and documentation in equipment setup.
01.09	Explain the importance of routine maintenance.
01.10	Identify customer needs. Document product and process compliance with customer requirements and needs.
02.0	Generate and interpret computer-aided design/drafting. The student will be able to:
02.01	Apply current industrial computer aided design and drafting practices.
02.02	Import and export various file types and formats.
02.03	Create and interpret technical drawings.
03.0	Demonstrate a fundamental understanding of electronics and electricity. The student will be able to:
03.01	Use appropriate electrical circuit grounding techniques.
03.02	Solve circuit problems using appropriate units and notation.
03.03	Operate appropriate test equipment.
04.0	Demonstrate an understanding of industrial safety, health, and environmental requirements. The student will be able to:
04.01	Identify and select appropriate Personal Protective Equipment (PPE).
04.02	Follow appropriate safety procedures.

	04.03 Follow applicable environmental laws and regulations.
	04.04 Identify and report unsafe conditions and practices.
	04.05 Explain when a machine or a process should be stopped to investigate an unsafe condition.
	04.06 Describe regulatory agency fines and requirements for corrective action.
	04.07 Use and evaluate information resources such as SDS (Safety Data Sheets).
05.0	Demonstrate proficiency in use of quality assurance methods and quality control concepts. The student will be able to:
	05.01 Apply quality methods to industrial processes.
	05.02 Apply quality principles to manufactured products.
	05.03 Document quality measurements and observations.
	05.04 Collect data from processes for analysis.
	05.05 Create plots of data given dependent and independent data values.
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 Use inspection equipment appropriately.
	06.03 Implement appropriate testing techniques and procedures.
	06.04 Use appropriate measurement tools.
	06.05 Use appropriate safety monitoring and testing equipment.
07.0	Demonstrate basic troubleshooting skills. The student will be able to:
	07.01 Apply critical thinking skills to identify problems.
	07.02 Identify discrepancies and changes in a system.
	07.03 Properly document process changes.
	07.04 Apply root cause analysis techniques to identify problem causes.
	07.05 Evaluate and implement corrective action option(s).
	07.06 Properly document all corrective actions.
	07.07 Identify and troubleshoot problems using collected process data.
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 Understand and follow oral instructions.
	08.05 Correctly use technical language and technical acronyms.
	08.06 Explain the important components of teamwork.
09.0	Demonstrate appropriate math skills. The student will be able to:
	09.01 Solve problems for appropriate scalars.
	09.02 Calculate tolerance(s).
	09.03 Use different unit systems appropriately.
	09.04 Convert between different units and unit systems.
	09.05 Use appropriate notation.
	09.06 Solve simple algebraic equations.
10.0	Demonstrate an understanding of modern business practices and strategies. The student will be able to:
	10.01 Demonstrate how production processes meet business requirements.
	10.02 Demonstrate how production goals of a company support the business objectives.
11.0	Demonstrate employability skills and identify career opportunities. The student will be able to:
	11.01 Describe the appropriate steps to acquire employment.
	11.02 Respond appropriately to professional criticism.
	11.03 Identify and practice professional work habits.
	11.04 Explain the importance of security and cybersecurity in the workplace.

Florida Department of Education
Curriculum Framework

Program Title: **Engineering Technology**
Specialization Tract: **Automation and Manufacturing**

Specialization Concepts and Content: 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.

Standards

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

12.0 Understand, operate, troubleshoot, and maintain automated systems.
13.0 Collecting and processing data from automated systems
14.0 Identify, implement and/or interpret data collected from automated systems.
15.0 Apply the principles of programmable logic controllers, human machine interfaces. and robotics to automated systems.
16.0 Apply the principles of industrial networking to automated systems.
17.0 Understand fundamental programming used in networked systems.
18.0 Understand the basic concept of cyber security.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Automation and Manufacturing**

CTE Standards and Benchmarks	
12.0	Understand, operate, troubleshoot, and maintain automated systems. The student will be able to:
	12.01 Identify, classify, and describe the functions of an automated systems
	12.02 Construct and interpret flow diagrams of an automated systems
	12.03 Configure, install, operate, and maintain an automated system

	12.04 Troubleshoot errors, faults, and inconsistencies in automated process components, devices and/or machines
	12.05 Use safe practices while operating an automated system
13.0	Collecting and processing data from automated systems. The student will be able to:
	13.01 Identify, classify, and describe the data collected in an automated system
	13.02 Create a database for data collection in an automated system
	13.03 Identify issues requiring advanced skills.
14.0	Identify, implement and/or interpret data collected from automated systems. The student will be able to:
	14.01 Identify data used for tracking productivity, quality, maintenance, and troubleshooting.
	14.02 Create a spreadsheet for collecting and organizing data for interpretation
	14.03 Create and interpret data collected using charts and graphical representation
	14.04 Identify and classify critical data for process improvement
	14.05 Identify and troubleshoot data to maintain automated processes
15.0	Apply the principles of programmable logic controllers, human machine interfaces. and robotics to automated systems. The student will be able to:
	15.01 Identify essential components and characteristics of programmable logic controllers, human machine interfaces. and robotics to automated systems.
	15.02 Analyze industrial tasks for the selection of programmable logic controllers, human machine interfaces. and robotics to automated systems
	15.03 Identify and Implement appropriate connected sensors and actuators for programmable logic controllers, human machine interfaces, and robotics to automated systems.
	15.04 Program programmable logic controllers, human machine interfaces, and robotics to automated systems.
	15.05 Troubleshoot errors, faults, and inconsistencies in programmable logic controllers, human machine interfaces, and robotics to automated systems.
16.0	Apply the principles of industrial networking to automated systems. The student will be able to:
	16.01 Identify proper protocols for establishing an industrial network
	16.02 Identify, classify, and describe components used in an industrial network
	16.03 Create and connect components to establish an industrial network
	16.04 Explain, operate, and maintain an industrial network
	16.05 Use safe practices while operating, troubleshooting, and maintaining an industrial network
	16.06 Integrate control systems and equipment with production and production support mechanisms
17.0	Understand fundamental programming used in networked systems. The student will be able to:
	17.01 Identify basic concepts of an object-oriented programming language using a programming language

	17.02	Describe basics of how a computer program functions
	17.03	Create a basic program using conditional statements, recursion, and functions.
18.0	Understand the basic concepts of Cybersecurity. The student will be able to:	
	18.01	Define the purpose of cybersecurity
	18.02	Describe how the concepts of Cyber Security are applied to automated systems
	18.03	Identify the causes for cybersecurity breaches
	18.04	Explain the procedures to prevent a cybersecurity breach

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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 lean and six sigma concepts in manufacturing environments.
14.0 Understand, operate, and maintain industrial automation systems.
15.0 Troubleshoot industrial automation systems.
16.0 Apply the principles of robotics to automated systems.
17.0 Create and operate human machine interfaces to control 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**

CTE Standards and Benchmarks	
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 functions of pneumatic, hydraulic, and electromechanical machines and components.
12.02	Construct and interpret flow diagrams of pneumatic, hydraulic, and electromechanical systems.
12.03	Configure, install, operate, and maintain pneumatic, hydraulic, and electromechanical components, devices and/or machines.
12.04	Troubleshoot errors, faults, and inconsistencies in pneumatic, hydraulic, and electromechanical components, machines and/or systems.
12.05	Define special applications of electromechanical, hydraulic, and pneumatic machines and devices used in manufacturing and process equipment.
12.06	Describe limitations of electromechanical, pneumatic and hydraulic systems.
12.07	Use safe practices while operating, troubleshooting, and maintaining industrial equipment.
13.0	Identify lean and six sigma concepts in manufacturing environments. The student will be able to:
13.01	Explain product manufacturing requirements.
13.02	Explain the role of each stakeholder in production operations.
13.03	Demonstrate and apply resources planning, six sigma, and lean manufacturing principles to production and process planning.
13.04	Demonstrate the continuous improvement process through cross-functional collaboration.
14.0	Understand, operate, and maintain industrial automation systems. The student will be able to:
14.01	Create and interpret schematic diagrams.
14.02	Explain, operate, maintain, and program industrial control systems.
14.03	Integrate control systems and equipment with production and production support mechanisms.
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	Use troubleshooting data to make systems improvement.
15.03	Identify issues requiring advanced skills.

	15.04 Troubleshoot problems and perform minor repairs to industrial automation systems.
16.0	Apply the principles of robotics to automated systems. The student will be able to:
	16.01 Identify the essential components and characteristics of a robotic system.
	16.02 Analyze industrial tasks for the selection of robotic equipment.
	16.03 Identify and implement appropriate connected sensors and actuators for robotic applications.
	16.04 Program a robotic device for a required task.
	16.05 Re-implement the robot to a new task.
17.0	Create and operate human machine interfaces to control automated systems. The student will be able to:
	17.01 Apply appropriate industrial standards in the development of HMI program.
	17.02 Establish communication for data flow between interface and controlled equipment.
	17.03 Perform interface testing and troubleshooting.
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
	18.11 Integrate control systems and equipment with production and production support mechanisms.
	18.12 Demonstrate automatic inventory accounting related monitoring and control systems.
	18.13 Implement automatic tracking of materials and products using bar codes, machine vision and sensing, and/or infrared technologies.
	18.14 Apply the 5S's: Sort, Set in Order, Shine, Standardize, and Sustain.

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**

CTE Standards and Benchmarks	
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 Demonstrate how to install cables and prepare ends.
	14.04 Demonstrate how to install different types of connectors.
	14.05 Demonstrate how to make loss measurements.
	14.06 Demonstrate how to install splices.
	14.07 Create and troubleshoot a fiber system.
15.0	Demonstrate proficiency in knowledge of instrumentation fundamentals. The student will be able to:
	15.01 Explain instruments, symbols and identifiers.
	15.02 Explain the fundamentals of pressure measurements.
	15.03 Explain the fundamentals of flow measurements.
	15.04 Explain the fundamentals of liquid levels measurements.
	15.05 Explain the fundamental temperature measurements.
	15.06 Explain the fundamentals of control systems.
16.0	Demonstrate proficiency in destructive and non-destructive testing. The student will be able to:
	16.01 Explain the concepts of inspection procedures used in (non-destructive testing (NDT).
	16.02 Explain the basic types of NDT.
	16.03 Perform hardness testing using both destructive and non-destructive testing.
	16.04 Perform magnetic particle testing used in NDT.
	16.05 Perform 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 renewable energy sources and technologies.
14.0 Apply energy storage, distribution, and conversion systems principles.
15.0 Characterize the operation and performance of solar energy systems.
16.0 Apply policy, regulation, and good business practices for renewable energy systems.

Florida Department of Education
Student Performance Standards

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

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

	12.22 Apply math knowledge required for fundamental DC and AC circuit analysis.
	12.23 Practice safety procedures required in an electrical lab environment.
13.0	Characterize renewable 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 Discuss the feasibility of emerging energy resources.
	13.04 Describe the major sources, scale, and impacts of alternative and renewable energy.
	13.05 Draw and label a diagram of a solar electric renewable energy system.
	13.06 Distinguish between various renewable energy sources and energy potential.
	13.07 Describe the social and environmental impact of renewable energy technologies vs. traditional energy sources.
	13.08 Explain the difference between passive solar and active solar thermal systems.
	13.09 Evaluate advantages and disadvantages of various renewable energy sources.
	13.10 Compare site selection requirements for various renewable energy installations.
	13.11 Compute cost/benefit analysis and return on investment calculations for a project.
	13.12 Evaluate local, state, and federal renewable energy rebates and incentives.
	13.13 Explain the methods used to connect renewable energy systems to a home or building.
14.0	Apply energy storage, distribution, and conversion systems principals. The student will be able to:
	14.01 Explain 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 energy storage 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 Describe current and emerging energy storage systems.
	14.08 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	Design and choose a solar energy system for optimal production based on the sun's position.
15.03	Distinguish between an azimuth and tilt angle 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	Demonstrate standard practices in system checkout, maintenance and troubleshooting a solar energy system.
15.09	Determine appropriately sized components for a solar energy system.
15.10	Describe benefits of renewable energy systems to the end customer through case studies.
16.0	Apply policy, regulation, and good business practices for renewable energy systems. The student will be able to:
16.01	Examine 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	Discuss the effects of financial, technical, and economic trends on the past, current, and future energy industry.
16.04	Demonstrate best practices for minimizing energy utilization.
16.05	Apply best practices based for energy production and resources use.
16.06	Discuss how different climatic, geological, atmospheric, and human activities influence energy production and utilization.
16.07	Identify conservation practices for natural resources used for energy production.
16.08	Explain the environmental impacts of energy extraction, conservation, and storage systems.
16.09	Discuss how the conversion to alternative energy affects various business sectors.
16.10	Discuss the application of governmental regulations and policy for energy production and utilization.
16.11	Compare and contrast local, state, and federal policy which positively and negatively effects the advancement of renewable energy investment and development.
16.12	Explain structure of electrical power distribution system.
16.13	Explain modernization steps being taken for improving the electrical power grid.

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**

CTE Standards and Benchmarks	
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 knowledge of using 2D and solid modeling software.
13.0 Demonstrate proficiency in 2D CAD and basic solid modeling fundamentals.
14.0 Demonstrate proficiency in engineering design fundamentals.
15.0 Demonstrate proficiency in advanced solid modeling tools and commands.
16.0 Demonstrate proficiency in advanced solid modeling, assemblies, and drawings.

Florida Department of Education
Student Performance Standards

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

CTE Standards and Benchmarks	
12.0	Demonstrate knowledge of using 2D and solid modeling software. The student will be able to:
12.01	Select the correct CAD command for specified tasks.
12.02	Develop the standard drawing arrangement needed for a standard information layout for specific drawing types.
12.03	Demonstrate proficiency in various plotting and printing options of CAD drawings.
12.04	Create and plot multiple setup and sizes of drawings.
12.05	Develop the attributes and standards needed for information in a drawings template for a specific drawing.
12.06	Implement existing CAD library files for new drawings.
12.07	Develop appropriate new library files when necessary.
12.08	Demonstrate sketch, modeling and drawing commands.
12.09	Demonstrate setup of drawing environment with multiple Layout sheets.
12.10	Apply standard dimensioning rules for Architectural, Mechanical, and Electrical.
12.11	Create the standard drawing views to document the design procedures.
13.0	Demonstrate proficiency in 2D CAD and basic solid modeling fundamentals. The student will be able to:
13.01	Implement the CAD commands for sketching and three-dimensional modeling.
13.02	Implement and apply the CAD three-dimensional coordinate system, work planes and surfaces for creating three-dimensional objects.
13.03	Convert sketches into extruded features.
13.04	Create the desired sketch to show the design intent in the solid modeling procedures.
13.05	Perform analyses on the sketch procedures and refine the sketch to be fully defined.
13.06	Align, rotate, and mirror two-dimensional and three-dimensional objects.
13.07	Choose and apply a type of material to a solid model.
13.08	Create bottom-up assembly and drawings.
13.09	Implement and apply basic software utilities for arranging, detailing, and plotting multiple views of a solid and assembly.

	13.10 Customize screen, toolbars, and pull down menus.
14.0	Demonstrate proficiency in engineering design fundamentals. The student will be able to:
	14.01 Create two and three-dimensional models and generate drawings related to graphic and industrial design.
	14.02 Define fundamental two-dimensional and three-dimensional concepts of graphic and industrial design.
	14.03 Measure and calculate properties of parts and assemblies.
	14.04 Perform analyses and refine industrial design.
	14.05 Demonstrate basic design principles of visual and spatial form as applied to products.
	14.06 Describe the fundamentals of product and system design as it relates to the manufacturing and physical considerations in design.
	14.07 Describe the theories related to product and systems design.
	14.08 Solve elementary problems related to the form and function of objects and structures.
	14.09 Describe the fundamentals of material selection for product and system design.
	14.10 Define the type of analysis of machined elements of a part or assembly.
	14.11 Conduct a system design analysis and identify the major phases.
	14.12 Implement sustainable practices in simulation design analysis.
	14.13 Apply design features to the two- and three-dimensional drawings.
15.0	Demonstrate proficiency in advanced solid modeling tools and commands. The student will be able to:
	15.01 Create and execute advanced templates.
	15.02 Apply and edit dimensions on a sketch and drawing.
	15.03 Create and use multiple work planes for advanced functions.
	15.04 Create solid models by extruding, revolving, sweeping, lofting, and shelling.
	15.05 Create and modify bottom-up assemblies.
	15.06 Define parts and components of an assembly in a BOM link to an Excel directory.
	15.07 Define parts of an assembly in a directory by balloons or labeling.
	15.08 Create exploded views of an assembly.
	15.09 Create multiple configurations of an individual part.
	15.10 Create configurations and add them to a part library.
	15.11 Perform advanced mating using multiple parts or sub-assemblies.

	15.12 Render a three-dimensional model and assembly.
	15.13 Render a solid model or assembly.
16.0	Demonstrate proficiency in advanced solid modeling and assembly. The student will be able to:
	16.01 Choose the appropriate design process for generating an advanced solid model.
	16.02 Select the correct advanced process for specified tasks.
	16.03 Perform sketch analyses on the sketch procedures and refine the sketch to define the modeling process.
	16.04 Create advanced assemblies using smart mates.
	16.05 Create and modify bottom up and top-down assemblies.
	16.06 Perform advanced surfacing of a part to create a solid model.
	16.07 Create sheet metal and flat pattern for parts and assemblies.
	16.08 Create structural elements in weldment for welded parts.
	16.09 Create weldment assemblies and cut list for welded projects.
	16.10 Create detailed molds or die cavities of parts and assemblies.
	16.11 Derive component parts from an edited mold base.
	16.12 Apply basic drawing concepts to molded parts.
	16.13 Apply the rapid prototyping processes for specific applications.
	16.14 Perform reverse engineering using the proper tools.
	16.15 Fabricate a part or an assembly using a rapid prototype machine.
	16.16 Describe the processes used in reverse engineering and scanning.
	16.17 Apply reverse engineering or scanning processes for specific applications.
	16.18 Fabricate a part or an assembly using reverse engineering or scanning equipment.
	16.19 Create a set of working shop drawings for manufactured parts.

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 tools 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 methods.

Florida Department of Education
Student Performance Standards

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

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in 3D digital modeling software packages for product design. The student will be able to:
12.01	Create basic solid models.
12.02	Create the standard drawing views to document the design.
12.03	Create an assembly model with functional sufficient mates and constraints.
12.04	Analyze part tolerances and dimensional precision.
13.0	Demonstrate proficiency in use of digital tools for product design. The student will be able to:
13.01	Create two and three-dimensional drawings related to industrial design.
13.02	Analyze and refine an industrial design as necessary.
13.03	Describe the fundamentals of product and system design as it relates to the manufacturing and structural considerations in design.
13.04	Describe the process of product and systems design.
13.05	Describe the fundamentals of material selection for product and system design.
13.06	Use various measuring machines and instruments for parts analysis.
13.07	Capture physical 3D objects, and reverse engineer accurate CAD models from the captures.
13.08	Analyze part tolerances and precision and describe how they impact design performance.
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 an additive manufacturing machine.
14.02	Compare the differing properties and characteristics of common materials used for additive manufacturing models.
14.03	Describe the various additive manufacturing processes and terminology.
14.04	Demonstrate integration of fasteners for robust assemblies of additive manufacturing produced components.
14.05	Describe the role of where different additive manufacturing methods and where they apply in the design and production lifecycle.
14.06	Demonstrate basic troubleshooting of additive manufacturing processes.
15.0	Demonstrate proficiency in the principles, concepts and applications in fabrication methods. The student will be able to:

15.01	Describe and compare traditional manufacturing methods with additive manufacturing.
15.02	Identify and characterize composite materials and commodities.
15.03	Identify uses and hazards involved in handling common composite supplies.
15.04	Describe the handling of composite materials, adhesives, solvents, etc. for safety.

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 basics and 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**

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in soldering basics and 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-Hole and Surface Mounted components.
12.07	Demonstrate the proper technique for soldering electrical connections.
12.08	Demonstrate the proper technique for de-soldering electrical connections.
12.09	Describe the fabrication and assembly processes of Printed Circuit Boards (PCB's).
12.10	Read and trace through schematic drawings.
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 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 to include 4 wire measurement techniques.
13.17	Analyze and troubleshoot circuits containing capacitors and inductors.
13.18	Apply various network theorems to DC circuits.
13.19	Select substitute components in troubleshooting.
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 troubleshoot AC inductive and capacitive circuits.
14.04	Define and apply the principles of transformers to AC circuits.
14.05	Analyze and troubleshoot AC circuits utilizing transformers.
14.06	Construct and verify the operation of differentiators and integrators to determine R-C and R-L time constraints.
14.07	Analyze and troubleshoot differentiator and integrator circuits.
14.08	Define the characteristics of resistive, inductive, and capacitive (RLC) circuits (series, parallel and complex).
14.09	Define the characteristics of series and parallel resonant circuits.
14.10	Define the characteristics of frequency selective filter circuits.
14.11	Define the characteristics of polyphase circuits.
14.12	Define basic motor and generator theory and operation.
14.13	Define basic generator theory and operation.
14.14	Set up and operate power supplies for AC circuits.
14.15	Apply lumped analysis to circuits and components.
14.16	Apply various network theorems to AC circuits.
14.17	Select substitute components in troubleshooting.

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 purpose diodes.
15.04	Construct and verify the operation of single and multi-stage devices.
15.05	Identify and define operating characteristics and applications of bipolar transistors.
15.06	Identify and define operating characteristics and applications of field effect transistors.
15.07	Identify and define operating characteristics and applications of single-stage amplifiers.
15.08	Construct and verify the operation of single-stage amplifiers.
15.09	Construct and verify thyristor circuitry.
15.10	Analyze and troubleshoot thyristor circuitry.
15.11	Set up and operate appropriate bench equipment for solid-state devices.
15.12	Set up and operate power supplies for solid-state devices.
15.13	Examine appropriate solid-state circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.
15.14	Identify and operate temperature measurement devices, including thermocouples and resistance temperature devices (RTDs).
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	Identify types of logic gates and their truth tables.
16.06	Construct combinational logic circuits using integrated circuits.
16.07	Troubleshoot logic circuits.
16.08	Analyze types of flip-flops and their truth tables.
16.09	Identify, define and measure characteristics of integrated circuit (IC) logic families.
16.10	Identify types of registers and counters.
16.11	Analyze clock and timing circuits.

16.12	Construct clock and timing circuits.
16.13	Identify types of arithmetic-logic circuits.
16.14	Identify types of encoding and decoding devices.
16.15	Construct encoders and decoders.
16.16	Identify types of multiplexer and demultiplexer circuits.
16.17	Identify types of memory circuits.
16.18	Identify types of digital displays.
16.19	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 differential and operational amplifiers.
17.06	Construct differential and operational amplifier circuits.
17.07	Analyze and troubleshoot differential and operational amplifier circuits.
17.08	Identify and define operating characteristics and applications of active filters.
17.09	Analyze and troubleshoot active filter circuits.
17.10	Identify and define operating characteristics and applications of sinusoidal and non-sinusoidal oscillator circuits.
17.11	Construct oscillator circuits.
17.12	Analyze and troubleshoot oscillator circuits.
17.13	Examine appropriate analog circuitry for other systems such as electronic communications, telecommunications, wireless, and other electronic applications.

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 Explain the principles, concepts, and applications in composite fabrication operations and processes.
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 3-D solid modeling design and programming.

Florida Department of Education
Student Performance Standards

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

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in the principles, concepts, and applications in metal fabrication methods. The student will be able to:
12.01	Identify and understand machining mathematical concepts, operations and measuring systems.
12.02	Interpret and identify mechanical drawings geometric features by referencing orthographic views, dimensions.
12.03	Demonstrate and identify the concepts and applications of Geometric Dimensioning and Tolerancing.
12.04	Identify properties of materials for metal fabrication and Machining processes.
12.05	Demonstrate safe use and operation of hand tools and power tools.
12.06	Identify processes in job planning and part layout.
12.07	Demonstrate proper setup and safe operation of metal forming equipment.
12.08	Identify appropriate applications of sheet metal forming and fastening.
12.09	Demonstrate and identify the proper use and reading of precision measuring.
13.0	Explain the principles, concepts, and applications in composite fabrication operations and processes. The student will be able to:
13.01	Demonstrate the safe and proper use of production equipment.
13.02	Apply and use basic safety equipment (PPE).
13.03	Apply OSHA safety rules concerning PPE for eye protection.
13.04	Apply OSHA safety rules concerning PPE for hearing protection.
14.0	Demonstrate proficiency in the set-up and operation of manual and CNC machining centers. The student will be able to:
14.01	Explain operation and maintenance procedures used for machine tools.
14.02	Identify cutting tool geometry and cutting tool materials used in CNC machining.
14.03	Demonstrate efficient toolpath processes used in 2D and 3D High Speed CNC machining operations.
14.04	Identify and perform CNC Code 4 used in toolpath operations.
14.05	Identify and implement appropriate CAM toolpath operations used in CNC machining.
14.06	Identify metal alloys and their properties in machining.

	14.07 Demonstrate job planning procedures in machining.
	14.08 Demonstrate and apply acceptable procedures in CNC job planning, tooling, selection, and programming.
15.0	Demonstrate proficiency in computer-aided drafting/computer-aided manufacturing (CAD/CAM) software. The student will be able to:
	15.01 Create geometry for post-processing used in CAD/CAM software.
16.0	Demonstrate proficiency in 3-D solid modeling design and programming. The student will be able to:
	16.01 Create working drawings to include orthographic views, sections and dimensions using a solid model.
	16.02 Identify appropriate applications for additive manufacturing processes to solid models.

Program Title: **Engineering Technology**
Specialization Tract: **Protection and Control Technology**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as Protection and Control Technician, Programmable Logic Control Operator, Instrumentation and Control Technician, and Plant Electrician 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 construction of protection and control relay systems.
13.0 Demonstrate proficiency in the maintenance of protection and control relay systems.
14.0 Demonstrate proficiency in troubleshooting protection and control relay systems.
15.0 Demonstrate proficiency in documentation management and control.
16.0 Demonstrate proficiency in SCADA (Supervisory Control and Data Acquisition) automation methods.
17.0 Demonstrate proficiency in protection and control technology safety protocols.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Protection and Control Technology**

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in the construction of protection and control relay systems. The student will be able to:
12.01	Illustrate the use of a project print package and construction scope with timeline.
12.02	Illustrate the use of protection and control standards and templates.
12.03	Explore power transformer theory, applications, assembly, processing, testing and commissioning.
12.04	Explore power circuit breaker theory, applications, assembly, testing, and commissioning.
12.05	Explore instrument transformer theory and applications (CT's and PT's).
12.06	Explore switches and miscellaneous devices.
12.07	Analyze protection and control enclosure construction practices.
12.08	Explore protection and control DC systems (Batteries and chargers).
12.09	Explore ground field, and equipment grounding applications.
12.10	Analyze protection and control applications and testing for electrical apparatus.
12.11	Explore protection and control relaying pilot channel communication schemes.
13.0	Demonstrate proficiency in the maintenance of protection and control relay systems. The student will be able to:
13.01	Analyze the theory of operation associated with electro-mechanical, microprocessor relays, and programmable logic controllers.
13.02	Illustrate the need for a relay maintenance testing program with set time intervals.
13.03	Illustrate protection and control relay and Power Line Carrier test set use and proficiency.
13.04	Illustrate the basic use of various hand tools and test equipment.
13.05	Illustrate the ability to use manufactures instructions, books, and white papers.
13.06	Discuss emergent electrical equipment replacement.
13.07	Discuss emergency electrical equipment replacement.
13.08	Illustrate performing protection and control relay in-service checks.
13.09	Analyze stored energy system proficiency relating to power circuit breakers, switch gear, and various mechanisms.

14.0	Demonstrate proficiency in troubleshooting protection and control relay systems. The student will be able to:
14.01	Analyze and apply OHM's law with regard to DC circuits.
14.02	Analyze and apply 3 phase A.C. power theory and applications.
14.03	Identify principles of impedance in an A.C. circuit (Resistance, capacitance, and inductance).
14.04	Analyze and apply miscellaneous electrical formulas associated with different electrical loads.
14.05	Analyze and apply relay protection and control schemes associated with electrical apparatus.
14.06	Illustrate proficiency in the use and application of relay protection and control settings and logic.
14.07	Illustrate proficiency in writing a trouble-shooting guide.
14.08	Analyze what it takes to make the right electrical repair.
15.0	Demonstrate proficiency in documentation management and control. The student will be able to:
15.01	Outline managing NERC protection and control relay testing records.
15.02	Outline managing NERC Substation apparatus testing records.
15.03	Explore (E.C.) engineering change request process (Engineer change approval process).
15.04	Analyze electric circuit functional testing and tracking process.
15.05	Illustrate red lining prints and documentation revision processes.
15.06	Determine the as-built documentation revision process.
15.07	Illustrate substation operating instructions.
15.08	Analyze protection and control relay settings, and relay event report archival process.
15.09	Outline writing functional testing guidelines.
15.10	Outline construction project material close out.
16.0	Demonstrate proficiency in SCADA (Supervisory Control and Data Acquisition) automation methods. The student will be able to:
16.01	Illustrate the use of various SCADA communications protocols.
16.02	Demonstrate knowledge of various SCADA hardware systems and applications.
16.03	Illustrate the use of SCADA test equipment.
16.04	Discuss cyber security knowledge and awareness.
16.05	Discuss the purpose of an "EMS" Energy Management System. (Energy Control Center).
16.06	Discuss NERC CIP and PRC regulations.

17.0	Demonstrate proficiency in protection and control technology safety protocols. The student will be able to:
	17.01 Demonstrate proficiency in electrical safety and personal protection.
	17.02 Illustrate the dangers of electrical back feed situations and step potential hazards.
	17.03 Analyze switching and tagging principles.
	17.04 Identify electrical lockout/tag out principles.
	17.05 Analyze human performance fundamentals and best practices.
	17.06 Explore safety using approved work methods.
	17.07 Outline performing “Risk Assessments” cause and effect.
	17.08 Discuss Arc Flash requirements.
	17.09 Identify stored energy sources and the associated dangers.

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**

CTE Standards and Benchmarks	
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 procedures to achieve Just-in-Time.
12.04	Identify and apply the techniques in continual improvement.
12.05	Describe and explain supply chain management.
12.06	Develop the techniques to manage change in the manufacturing environment.
12.07	Identify and explain basic cellular manufacturing concepts associated with basic cellular manufacturing concepts.
13.0	Demonstrate proficiency in developing self-directed work teams. The student will be able to:
13.01	Describe and explain development and organization of a self-directed work team.
13.02	Create work plans.
13.03	Identify the steps in ending a project.
13.04	Use data effectively in identifying issues.
13.05	Implement changes through planning and communications.
13.06	Update appropriate documentation in 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.
14.03	Describe and apply the concept 5 S.
14.04	Describe and explain the visual solutions workplace environment.
14.05	Identify and explain the changeover techniques used in production.
14.06	Describe the terms used in overall equipment effectiveness (OEE).

	14.07 Describe and explain the process of total productive maintenance (TPM).
	14.08 Identify the techniques used in the kanban system for just-in-time (JIT).
	14.09 Identify and apply value stream mapping and other mapping methods.
15.0	Demonstrate proficiency in Six Sigma concepts. The student will be able to:
	15.01 Describe and explain the philosophy and methodology of Six Sigma.
	15.02 Define the five steps of the DMAIC (define, measure, analyze, improve, and control) model used in Six Sigma for quality improvement.
	15.03 Establish an advanced quality plan.
	15.04 Establish and use project benchmarks.
	15.05 Develop the basic cause-and-effect diagram (fishbone diagram).
	15.06 Describe and develop the central limit theorem.
	15.07 Develop a control plan to aid in production.
	15.08 Define the cost-benefit analysis on the shop floor.
	15.09 Define and describe the design of experiments (DOE) used in manufacturing processes.
	15.10 Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
	15.11 Apply the techniques of Process Failure Modes and Effects Analysis (PFMEA).
	15.12 Maintain and check the process through quality auditing.
	15.13 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 Apply the DOE in manufacturing and non-manufacturing environments using the proper techniques.
	16.04 Apply the techniques of Process Failure Modes and Effects Analysis (PFMEA).
	16.05 Implement the 5S's method of sorting, setting in order, shining, standardizing, and sustaining.
	16.06 Apply the Six Sigma standards to non-manufacturing environments.
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.

17.03	Calculate Cost of Quality.
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.
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 Lean Manufacturing.
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: **Supply Chain Automation**

Specialization Concepts and Content: The purpose of this program is to prepare students for initial employment with an occupational title as a Supply Chain Automation Engineering Technician, Supply Chain and Operations Management, Manufacturing Engineering Technician, Advanced Manufacturing or Production Technician in various specialized areas, or to provide supplemental training for persons previously or currently employed in these occupations to install, operate, support, upgrade or maintain automated material handling equipment and systems that support the supply chain and automated distribution centers.

Standards

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

12.0 Demonstrate proficiency in print reading and interpreting industrial diagrams and blueprints.
13.0 Demonstrate proficiency in automated warehousing and materials handling.
14.0 Demonstrate an understanding of machine fundamentals, components, maintenance, and mechanical troubleshooting.
15.0 Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in manufacturing and supply chain automation.
16.0 Demonstrate proficiency in industrial control systems.
17.0 Demonstrate proficiency in troubleshooting of Automated Controls Systems
18.0 Demonstrate proficiency in fabrication techniques applied in supply chain automation systems.

Florida Department of Education
Student Performance Standards

Program Title: **Engineering Technology**
Specialization Tract: **Supply Chain Automation**

CTE Standards and Benchmarks	
12.0	Demonstrate proficiency in print reading and interpreting industrial diagrams and blueprints. The student will be able to:
12.01	Define print and schematic related to manufacturing and automation systems such as electrical, fluid power, and piping.
12.02	Recognize and name a variety of geometric shapes.
12.03	Describe types and use of scales.
12.04	Demonstrate an understanding of 2D and 3D views.
12.05	Explain types and procedures of sketching including section views.
12.06	Define the use of a leader line.
12.07	Describe the general rules for dimension placement.
12.08	Define types, features and applications of tolerance.
12.09	Explain the purpose of a wiring diagram as well as symbols and lines on an electrical schematic.
12.10	Describe the function of various components in a piping system.
12.11	Name and describe the ways of joining pipe.
12.12	Explain and identify various pipes and kind of fittings and valves.
13.0	Demonstrate proficiency in automated warehousing. The student will be able to:
13.01	Explain the functions and procedures for public and private automated warehouses.
13.02	Develop common warehouse documents.
13.03	Explain the importance of maintaining inventory records of automated warehouse
13.04	Analyze computerized warehouse data for planning, organizing, staffing, directing and controlling warehouse operations.
13.05	Identify various labeling and packaging schemes.
13.06	Identify the equipment needed and appropriate methods for storage to facilitate an efficient warehouse.
13.07	Integrate warehouse control systems and equipment with production.
13.08	Develop routine warehouse operation and maintenance schedules.

14.0	Demonstrate an understanding of machine fundamentals, maintenance, and mechanical troubleshooting. The student will be able to:
14.01	Perform routine maintenance of machines and equipment.
14.02	Identify the characteristics of seals, bearing, lubricants, and fasteners.
14.03	Explain torque, stress, stretch, corrosion, galling and thread types.
14.04	Troubleshoot major components of an automation and manufacturing system.
14.05	Identify and explain the function of subcomponents.
14.06	Identify the types and functions of lubricant additives.
14.07	Apply proper lubrication to mechanical system.
14.08	Operate various types of motor and pump oil flushes.
14.09	Use precision measuring instruments in an automated system.
14.10	Describe hand and power tools, belts/sheaves, bearings, gears, couplings, pumps, and shaft alignments.
14.11	Install seals, bearings, fasteners, chain and gear drives
14.12	Demonstrate disassemble and assemble pumping stations.
14.13	Troubleshoot problems and perform minor repairs to warehouse automation and robotic systems
15.0	Demonstrate current and emerging strategies and technologies used to collect, analyze, record, and share information in manufacturing and supply chain automation. The student will be able to:
15.01	Identify, install and use hardware necessary to support manufacturing and supply chain application software.
15.02	Use supply chain automation technology tools to maintain, secure and monitor operations.
15.03	Use inventory and control systems and software to purchase materials, supplies, and equipment (e.g., Last In, First Out [LIFO]; First In, First Out [FIFO]; Just in Time [JIT]; LEAN).
16.0	Demonstrate proficiency in industrial control systems. The student will be able to:
16.01	Analyze common industrial control systems. (e.g., Servomechanisms, Motion Control, Batch Process Control, and Sequential Process)
16.02	Describe differences between motion and process control manufacturing equipment.
16.03	Operate various types and function of DC motors.
16.04	Describe the different types of motions that are controlled by servomechanisms.
16.05	Install various types of single and three-phase AC motors.
16.06	Examine different control circuits, e.g., two-wire controls, three-wire controls, hands-off-automatic controls, multi-pushbuttons, mechanical interlock for reversing control, sequence control, etc.
16.07	Analyze inductive, capacitive, and Hall Effect proximity sensors.

16.08	Install various types of relays, transformers, and electric motors.
16.09	Assemble different jogging control circuits using a control relay and a reversing starter or reversing starter and a selector Switch.
16.10	Understand the common control modes used by industrial controllers.
16.11	Identify the elements of solid-state motor controls and variable speed drives.
16.12	Install components in hydraulic, pneumatic, and fluid power systems
16.13	Install types of gears, couplings, belts and chains used in the automation systems.
16.14	Explain the difference between overload current and short circuit current.
16.15	Identify the differences between open-loop and closed-loop systems.
17.0	Demonstrate troubleshooting fundamentals of Automated Controls Systems. The student will be able to:
17.01	Describe the proper troubleshooting safety procedures of an automated system.
17.02	Identify the various factors of the troubleshooting process.
17.03	Describe system-troubleshooting techniques containing sensors, PLCs, Robots, HMIs and other common manufacturing and automation equipment.
17.04	Troubleshoot reduced voltage starters.
17.05	Define and explain the difference between linear and rotary actuation.
17.06	Construct and troubleshoot manual and magnetic motor circuits.
17.07	Construct and troubleshoot relay logic circuits.
17.08	Analyze and troubleshoot variable frequency and variable speed AC and DC drives.
17.09	Troubleshoot timing control circuits.
17.10	Troubleshoot industrial power distribution systems.
17.11	Analyze, construct, and troubleshoot photoelectric, proximity sensor circuits and transducer circuits.
17.12	Troubleshoot pump system failure conditions (e.g., cavitation).
18.0	Demonstrate proficiency in fabrication techniques applied in supply chain automation systems. The student will be able to:
18.01	Understand the processes of separating, forming, and conditioning, fabricating, and finishing of materials.
18.02	Apply safe fabrication techniques in an automation system.
18.03	Make minor repairs to equipment and accessories of an automation system.
18.04	Describe fabrication techniques used in automation systems.

Additional Information

Laboratory Activities

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

General Education Course Requirements for AS and AAS Degrees

State Board of Education Rule 6A-14.030(4), F.A.C., identifies 15 credit hours as the minimum amount of general education coursework required in the Associate of Science (AS) degree and the Associate of Applied Science (AAS) degree. In addition, Rule 6A-14.0303, F.A.C., implements s. 1007.25, F.S., and requires students entering a technical education degree program in the 2022-2023 academic year, and thereafter, to complete at least one identified core course in each subject area as part of the general education course requirements (15 credit hours total) before a degree is awarded) The core subject areas include:

- Communication.
- Humanities.
- Mathematics.
- Natural Sciences.
- Social Sciences.

Career and Technical Student Organization (CTSO)

SkillsUSA is the co-curricular 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.

Accommodations

Federal and state legislation requires the provision of accommodations for students with disabilities to meet individual needs and ensure equal access. Postsecondary students with disabilities must self-identify, present documentation, request accommodations if needed, and develop a plan with their counselor and/or instructors. Accommodations received in postsecondary education may differ from those received in secondary education. Accommodations change the way the student is instructed. Students with disabilities may need accommodations in such areas as instructional methods and materials, assignments and assessments, time demands and schedules, learning environment, assistive technology and special communication systems. Documentation of the accommodations requested and provided should be maintained in a confidential file.

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:

Alternative Energy Systems Specialist (0615170101) – 18 credit hours
Applied Technology Specialist (0615061203) – 16 credit hours
Automation (0615040601) – 12 credit hours (Daggered for Deletion)
CNC Composite Fabricator/Programmer (0615080501) – 12 credit hours
CNC Machinist/Fabricator (0648051002) – 12 credit hours
CNC Machinist Operator/Programmer (0615000015) – 12 credit hours
Composite Fabrication and Testing (0615061700) – 19 credit hours
Computer-Aided Design and Drafting (0615130304) – 24 credit hours
Digital Manufacturing Specialist (0615000009) – 24 credit hours
Electronics Aide (0615030313) – 12 credit hours
Engineering Technology Support Specialist (0615000007) – 18 credit hours
Lean Manufacturing (0615061302) – 12 credit hours (Daggered for Deletion)
Lean Six Sigma Green Belt Certificate (0615070203) – 12 credit hours
Mechanical Designer and Programmer (0615080503) – 12 credit hours
Mechatronics (0615000013) – 30 credit hours (Daggered for Deletion)
Medical Quality Systems (0641010105) – 15 credit hours
Pneumatics, Hydraulics and Motors for Manufacturing (0615061303) – 12 credit hours (Daggered for Deletion)
Rapid Prototyping Specialist (0615130211) – 12 credit hours
Six Sigma Black Belt Certificate (0615070202) – 12 credit hours

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