**2020 - 2021**

# Florida Department of Education

# Curriculum Framework

## Program Title: Applied Engineering Technology

## Program Type: Non Career Preparatory

## Career Cluster: Engineering & Technology Education

| **Secondary – Non Career Preparatory** | |
| --- | --- |
| Program Number | 8401100 |
| CIP Number | 0614130100 |
| Grade Level | 9-12 |
| Standard Length | 3 credits |
| Teacher Certification | Refer to the **Program Structure** section |
| CTSO | FL-TSA, SkillsUSA |
| CTE Program Resources | <http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml> |

### Purpose

The purpose of this program is to provide students with a foundation of knowledge and technically oriented experiences in the study of applied engineering and its effect upon our lives and the choosing of an occupation. The content and activities will also include the study of entrepreneurship, safety, 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.

The content includes but is not limited to study in mechanical, electrical, civil, and environmental engineering disciplines.

**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 credits.

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

The following table illustrates the secondary program structure:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Course Number | Course Title | Teacher Certification | Length | Level | Graduation Requirement |
| 8401110 | Applied Engineering Technology I | ENG 7G  ENG TEC 7G  TEC ED 1 @2  ENG&TEC ED1@2 | 1 credit | 3 | PA |
| 8401120 | Applied Engineering Technology II | 1 credit | 3 |  |
| 8401130 | Applied Engineering Technology III | 1 credit | 3 | PA |

*(Graduation Requirement Abbreviations- EQ= Equally Rigorous Science, PA= Practical Arts, EC= Economics)*

In addition to the above courses, the Advanced Technology Applications (8601900) course is appropriate to be used for content area continuation in this program after all three credits of this program have been completed. The purpose of the Advanced Technology Applications course is to provide students with a capstone opportunity to develop a school based project from "vision" to "reality," working in teams to design, engineer, manufacture, construct, test, redesign, test again; and then produce a finished "project". This would involve using ALL the knowledge previously learned, not only in Engineering & Technology Education but also across the curriculum. See the Advanced Technology Applications framework for more information.

### 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:

1. Demonstrate an understanding of the characteristics, scope and core concepts of technology.
2. Demonstrate an understanding of the attributes of design and the engineering design process.
3. Describe the functional characteristics of the engineering design team.
4. Demonstrate skill in technical sketching and drawing as it relates to engineering design.
5. Successfully work as a member of a team.
6. Demonstrate basic computer-aided design (CAD) knowledge and skills.
7. Demonstrate foundational knowledge and skills associated with the design of engineering systems (e.g. mechanical, fluid, thermal, electrical, and electronic systems).
8. Demonstrate technical knowledge and skills for machining.
9. Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works.
10. Demonstrate foundational knowledge and skills associated with common computer peripherals and computer functions.
11. Demonstrate knowledge of computer file management.
12. Demonstrate proficiency using the Internet to locate information.
13. Develop fundamental business productivity software skills.
14. Develop an understanding of computer programming concepts.
15. Demonstrate safe and appropriate use of tools.
16. Demonstrate an understanding of the various approaches used in problem solving.
17. Demonstrate the abilities to apply the design process.
18. Demonstrate proficiency using business productivity software skills.
19. Apply fundamental computer programming concepts.
20. Perform an engineering project requiring design or re-design of an engineering system (e.g. mechanical, fluid, thermal, electrical, and electronic systems)
21. Demonstrate and apply computer-aided design (CAD) knowledge and skills.
22. Demonstrate fundamental math and science knowledge and skills for mechanical, fluid, thermal, and/or electrical/electronic systems.
23. Demonstrate safe and appropriate use of basic tools and machines.
24. Demonstrate an understanding of the cultural, social, economic, and political effects of technology.
25. Demonstrate an understanding of the effects of technology on the environment.
26. Demonstrate the abilities to assess the impact of products and systems.
27. Plan, organize, and carry out a project plan.
28. Manage resources.
29. Use tools, materials, and processes in an appropriate and safe manner.

### Mechanical Engineering Discipline

1. Demonstrate an understanding of design and development of solutions involving mechanical engineering, their environments, and their associated design constraints.
2. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.

### Electrical Engineering Discipline

1. Demonstrate an understanding of design and development of solutions involving electrical engineering, their environments, and their associated design constraints.
2. Demonstrate technical knowledge and skills associated with the design of electrical and electronic systems.
3. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.

### Civil Engineering Discipline

1. Demonstrate an understanding of design and development of solutions involving civil engineering, their environments, and their associated design constraints.
2. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.

### Environmental Engineering Discipline

1. Demonstrate an understanding of design and development of solutions involving mechanical engineering, their environments, and their associated design constraints.
2. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.

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# Florida Department of Education

# Student Performance Standards

## Course Title: Applied Engineering Technology I

## Course Number: 8401110

## Course Credit: 1

## Course Description:

This course helps students understand the field of engineering/engineering technology and prepares them for postsecondary engineering programs by developing a more in-depth mastery of the associated mathematics, science, and technology knowledge and skills. The course also includes essential concepts of technology and design, as well as concerns about the social and political implications of technological change.

| **CTE Standards and Benchmarks** |
| --- |
| 1. Demonstrate an understanding of the characteristics, scope and core concepts of technology.--The student will be able to: |
| * 1. Explain the rapid increase in the rate of technological development and the trade-offs between competing values (e.g., availability, cost, desirability, waste, et al) in the selection of resources. |
| * 1. Discuss current technological developments that are/were driven by profit motive and the market. |
| * 1. Explain how technological progress promotes advancement of science and mathematics. |
| * 1. Identify new technologies that create new processes and describe ways in which technology helps to shape social, cultural, political, and economic aspects of society. |
| 1. Demonstrate an understanding of the attributes of design and the engineering design process.--The student will be able to: |
| * 1. Describe the essential activities and the sequence of steps associated with the design process. |
| * 1. Discuss why the engineering design process must begin with a clearly stated problem and write a problem statement in sufficient clarity to enable design goals, requirements, and constraints to be identified. |
| * 1. Critique the design of a solution and revise the design as needed. |
| * 1. Explain the relationship between design criteria and design constraints and how a design’s criteria, constraints, and efficiency can compete with each other. |
| * 1. Demonstrate brainstorming techniques. |
| * 1. Identify the factors that ensure the safety and sustainability of an engineering design or product. |
| * 1. Compare and contrast creative and analytic problem-solving strategies to the engineering design process. |
| * 1. Identify safety considerations when designing a product. |
| * 1. Apply engineering notebook standards and protocols. |
| * 1. Explain the forms of analysis used in evaluating potential solutions, particularly those forms associated with engineering principles, estimation, economics, and worst case scenario. |
| * 1. Describe a decision table and how it is used to evaluate proposed solutions to an engineering problem. |
| 1. Describe the functional characteristics of the engineering design team.--The student will be able to: |
| * 1. Describe how work breakdown structure (WBS) impacts the makeup and organization of an engineering design team. |
| * 1. Compare functional and hierarchical schemes for organizing an engineering design team. |
| * 1. Describe the function of management in general and project management in particular. |
| * 1. Describe a typical design project team structure. |
| * 1. Outline a research methodology. |
| * 1. Explain the role of ethics as a part of responsible decision making. |
| 1. Demonstrate skill in technical sketching and drawing as it relates to engineering design.--The student will be able to: |
| * 1. Explain the concepts of technical sketching and drawing. |
| * 1. Understand and interpret basic engineering drawings. |
| * 1. Create an orthographic sketch or drawing with appropriate layout, dimensions, and details for construction. |
| * 1. Create an isometric sketch or drawing. |
| 1. Successfully work as a member of a team.--The student will be able to: |
| * 1. Accept responsibility for specific tasks in a given situation. |
| * 1. Maintain a positive relationship with other team members. |
| * 1. Document progress, and provide feedback on work accomplished in a timely manner. |
| * 1. Complete assigned tasks in a timely and professional manner. |
| * 1. Reassign responsibilities when the need arises. |
| * 1. Complete daily tasks as assigned on one’s own initiative. |
| 1. Demonstrate basic computer-aided design (CAD) knowledge and skills.--The student will be able to: |
| * 1. Demonstrate use of the various functions of CAD software. |
| * 1. Apply basic CAD skills to a mechanical drawing (e.g. layers, linetype, lineweight, viewport, scaling, units, limits, etc) |
| * 1. Create a part using a solid modeling CAD software platform. |
| * 1. Create an assembly drawing using a CAD software platform. |
| * 1. Create a pictorial drawing using a CAD software platform (e.g. isometric, perspective, oblique) |
| * 1. Create an orthographic drawing using a CAD software platform. |
| * 1. Create a bill of materials generated from a CAD application. |
| 1. Demonstrate foundational knowledge and skills associated with the design of engineering systems (e.g. mechanical, fluid, thermal, electrical, and electronic systems).--The student will be able to: |
| * 1. Measure and calculate dimensions of parts using metric and U.S. customary systems. |
| * 1. Identify simple machines. |
| * 1. Calculate mechanical advantage. |
| * 1. Define and calculate scientific quantities that are used in engineering designs (e.g. mass, weight, force, torque, friction, pressure, flow rate, voltage, current, resistance). |
| * 1. Draw and read system schematics (e.g. electrical and fluid circuits). |
| * 1. Define scientific principles as they relate to the design of mechanical and electrical systems (e.g. Newton’s Laws of motion, Ohm’s Law, the three laws of thermodynamics). |
| * 1. Compare and contrast between related scientific and engineering principles (e.g. pneumatics and hydraulics, heat and temperature, series and parallel circuits, alternating and direct current). |
| * 1. Assemble, operate, and identify the parts of a mechanical system. |
| 1. Demonstrate technical knowledge and skills for machining.--The student will be able to: |
| * 1. Measure dimensions using precision measurement tools, such as rulers, scales, calipers, and micrometers. |
| * 1. Identify appropriate tools for machining purposes (e.g., drilling, turning, milling, sawing, and grinding). |
| * 1. Explain steps for assembly and fabrication of products. |
| 1. Demonstrate technical knowledge and skills in the designing, engineering, and analysis of constructed works.--The student will be able to: |
| * 1. Define terminology associated with engineering products and systems. |
| * 1. Define and describe the experimental method as it is applied to design. |
| * 1. Describe simulation. |
| * 1. Prepare a model of a design solution to an engineering problem. |
| * 1. Prepare a graphical solution to an engineering problem. |
| * 1. Prepare a mathematical solution to an engineering problem (using either a calculator or computer). |
| * 1. Present a technical report on an engineering design problem, concept or issue. |
| 1. Demonstrate foundational knowledge and skills associated with common computer peripherals and computer functions.--The student will be able to: |
| * 1. Identify and describe the various internal and external components of a computer and their functions (e.g., power supply, hard drive, RAM, mother board, I/O cards/ports, cabling, etc.). |
| * 1. Describe and connect types and purposes of various computer input devices (e.g., USB, firewall, parallel and serial, Ethernet, printers, camera). |
| 1. Demonstrate knowledge of computer file management.--The student will be able to: |
| * 1. Describe and use conventional file naming conventions. |
| * 1. Demonstrate proficiency with file management tasks (e.g., folder creation, file creation, backup, copy, delete, open, save). |
| * 1. Be able to identify file types by extension (e.g., .doc, .txt, .wav, xls, dwg, etc.). |
| 1. Demonstrate proficiency using the Internet to locate information.--The student will be able to: |
| * 1. Identify and use web terminology. |
| * 1. Define Universal Resource Locators (URLs) and associated protocols (e.g., http, ftp, telnet, mailto). |
| * 1. Compare and contrast the types of Internet domains (e.g., .com, .org, .edu, .gov, .net, .mil). |
| * 1. Demonstrate proficiency using search engines, including Boolean search techniques. |
| * 1. Apply the rules for properly citing works or other information obtained from the Internet. |
| * 1. Identify and apply Copyright Fair Use guidelines. |
| * 1. Evaluate online information for credibility and quality using basic guidelines and indicators (e.g. authority, affiliation, purpose, etc.). |
| 1. Develop fundamental business productivity software skills.--The students will be able to: |
| * 1. Use appropriate functions in a word processing program. (e.g. format text, insert tables, create bulleted lists). |
| * 1. Describe a spreadsheet and the ways in which it may be used. |
| * 1. Use appropriate functions in a spreadsheet program. (e.g. insert and format text, merge cells, sort data, insert columns and rows). |
| * 1. Describe presentation software, the ways it may be used and appropriate presentation delivery skills. |
| * 1. Use appropriate functions in a presentation software program. (e.g. insert images, duplicate slides, format text). |
| 1. Develop an understanding of computer programming concepts.--The student will be able to: |
| * 1. Create a flowchart that visually describes a basic task. |
| * 1. Describe different computer programming languages and functions. |
| * 1. Create a basic computer program. |
| 1. Demonstrate safe and appropriate use of tools.--The student will be able to: |
| * 1. Select appropriate tools, procedures, and/or equipment. |
| * 1. Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. |
| * 1. Follow laboratory safety rules and procedures. |
| * 1. Demonstrate good housekeeping at workstation within total laboratory. |
| * 1. Identify color-coding safety standards. |
| * 1. Explain fire prevention and safety precautions and practices for extinguishing fires. |
| * 1. Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. |

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# Florida Department of Education

# Student Performance Standards

## Course Title: Applied Engineering Technology II

## Course Number: 8401120

## Course Credit: 1

## Course Description:

This course provides students with opportunities to further their mastery of engineering-related math and science principles to design solutions to real world problems. The course also includes a more in-depth look into the relationship between technology and design.

| **CTE Standards and Benchmarks** |
| --- |
| 1. Demonstrate an understanding of the various approaches used in problem solving.--The student will be able to: |
| * 1. Employ research and development processes to assess the functional, economic, and ethical viability of a product or prototype. |
| * 1. Research a problem and determine the most appropriate problem-solving method to employ. |
| * 1. Utilize a multidisciplinary approach to solving technological problems. |
| 1. Demonstrate the abilities to apply the design process.--The student will be able to: |
| * 1. Determine whether a design problem is worthy of being resolved or addressed. |
| * 1. Identify the criteria and constraints associated with a design problem and select the most appropriate solution based on pre-determined factors. |
| * 1. Evaluate the quality, efficiency, and viability of an existing or proposed design and refine the design accordingly. |
| * 1. Evaluate an existing design using conceptual, physical, and mathematical models and note aspects for improvement. |
| * 1. Devise and develop a problem solution using the design process. |
| * 1. Create and deliver a presentation to communicate the design process and final solution to a design problem. |
| 1. Successfully work as a member of a team.--The student will be able to: |
| * 1. Accept responsibility for specific tasks in a given situation. |
| * 1. Maintain a positive relationship with other team members. |
| * 1. Document progress, and provide feedback on work accomplished in a timely manner. |
| * 1. Complete assigned tasks in a timely and professional manner. |
| * 1. Reassign responsibilities when the need arises. |
| * 1. Complete daily tasks as assigned on one’s own initiative. |
| 1. Demonstrate proficiency using business productivity software skills.--The students will be able to: |
| * 1. Create a report or essay that contains a title page, text, a graphic/image, and data table. |
| * 1. Create a spreadsheet to analyze and present data. |
| * 1. Produce a presentation that includes text, graphics, and digital images and present it using a projection system. |
| 1. Apply fundamental computer programming concepts.--The student will be able to: |
| * 1. Create a flowchart to communicate the solution to an engineering design problem. |
| * 1. Use a computer programming language to create code to accomplish a specific goal. |
| 1. Perform an engineering project requiring design or re-design of an engineering system (e.g. mechanical, fluid, thermal, electrical, and electronic systems).--The student will be able to: |
| * 1. Identify an engineering problem or product for improvement using engineering design methodology. |
| * 1. Develop a written plan of work for the engineering team to carry out the project. |
| * 1. Show evidence of technical research in support of the project. |
| * 1. Perform skills related to the engineering project. |
| * 1. Document the project’s progress in an engineering notebook. |
| * 1. Complete the project as planned. |
| * 1. Demonstrate and present an engineering design solution to a fluid, electrical, thermal, or mechanical system problem. |
| * 1. Formulate conclusions based on the analysis of engineered products. |
| 1. Demonstrate and apply computer-aided design (CAD) knowledge and skills.--The student will be able to: |
| * 1. Apply CAD skills to an engineering project. |
| * 1. Create a part using a solid modeling CAD software platform to be incorporated into an assembly. |
| * 1. Create an assembly drawing using a CAD software platform. |
| * 1. Create working drawings using a CAD software platform. |
| * 1. Create a bill of materials generated from a CAD application. |
| 1. Demonstrate fundamental math and science knowledge and skills for mechanical, fluid, thermal, and/or electrical/electronic systems.--The student will be able to: |
| * 1. Define and calculate quantities using Hooke’s Law, Boyle’s Law, heat and temperature, and/or Ohm’s Law. |
| * 1. Assemble, operate, and identify the parts of a mechanical, fluid, thermal, and/or electrical/electronic system. |
| * 1. Demonstrate and apply principles of force, work, rate, resistance, energy, power, and force transformers relating to mechanical, fluid, thermal, and/or electrical/electronic system. |
| * 1. Calculate the mechanical advantage of a mechanical, fluid, and/or thermal system. |
| * 1. Design a mechanical, fluid, thermal, and/or electrical/electronic system. |
| 1. Demonstrate safe and appropriate use of basic tools and machines.--The student will be able to: |
| * 1. Select appropriate tools, procedures, and/or equipment. |
| * 1. Demonstrate the safe usage of appropriate tools, procedures, and operation of equipment. |
| * 1. Follow laboratory safety rules and procedures. |
| * 1. Demonstrate good housekeeping at workstation within total laboratory. |
| * 1. Identify color-coding safety standards. |
| * 1. Explain fire prevention and safety precautions and practices for extinguishing fires. |
| * 1. Identify harmful effects/potential dangers of familiar hazardous substances/devices to people and the environment. |

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# Student Performance Standards

## Course Title: Applied Engineering Technology III

## Course Number: 8401130

## Course Credit: 1

## Course Description:

This course provides opportunities for students to apply their acquired knowledge and skills in engineering scenarios. The course features multiple options for providing context-based projects oriented to specific fields of engineering. This feature enables instruction in complex projects involving multi-faceted project teams by providing instruction oriented to four key engineering disciplines: mechanical, electrical, civil, and environmental. **Students need only complete standards #30, #31, and #32 for one of the engineering disciplines, in addition to the other standards.**

| **CTE Standards and Benchmarks** |
| --- |
| 1. Demonstrate an understanding of the cultural, social, economic, and political effects of technology.--The student will be able to: |
| * 1. Discuss changes in cultural, social, economic, and political behavior caused by the use of technology. |
| * 1. Describe the consequences of weighing the trade-offs between the positive and negative effects of technology. |
| * 1. Discuss the ethical considerations in developing, selecting, and using technology. |
| * 1. Debate the cultural, social, economic, and political changes caused by the transfer of a technology from one society to another. |
| 1. Demonstrate an understanding of the effects of technology on the environment.--The student will be able to: |
| * 1. Describe the trade-offs of developing technologies to reduce the use of resources. |
| * 1. Describe how the alignment of technological and natural processes impacts the environment. |
| * 1. Identify technologies developed for the purpose of reducing negative consequences of other technologies. |
| * 1. Debate the implementation of technologies having positive and negative effects on the environment. |
| 1. Demonstrate the abilities to assess the impact of products and systems.--The student will be able to: |
| * 1. Collect information and evaluate its quality. |
| * 1. Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment. |
| * 1. Apply assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology. |
| * 1. Design forecasting techniques to evaluate the results of altering natural systems. |
| 1. Successfully work as a member of a team.--The student will be able to: |
| * 1. Accept responsibility for specific tasks in a given situation. |
| * 1. Maintain a positive relationship with other team members. |
| * 1. Document progress, and provide feedback on work accomplished in a timely manner. |
| * 1. Complete assigned tasks in a timely and professional manner. |
| * 1. Reassign responsibilities when the need arises. |
| * 1. Complete daily tasks as assigned on one’s own initiative. |
| 1. Plan, organize, and carry out a project plan.--The student will be able to: |
| * 1. Determine the scope of a project. |
| * 1. Organize the team according to individual strengths. |
| * 1. Assign specific tasks within a team. |
| * 1. Determine project priorities. |
| * 1. Identify required resources. |
| * 1. Record project progress in an engineering notebook. |
| * 1. Record and account for budget expenses during the life of the project. |
| * 1. Carry out the project plan to successful completion and delivery. |
| 1. Manage resources.--The student will be able to: |
| * 1. Identify required resources and associated costs for each stage of the project plan. |
| * 1. Create a project budget based on the identified resources. |
| * 1. Determine the methods needed to acquire needed resources. |
| * 1. Demonstrate good judgment in the use of resources. |
| * 1. Recycle and reuse resources where appropriate. |
| * 1. Demonstrate an understanding of proper legal and ethical waste disposal. |
| 1. Use tools, materials, and processes in an appropriate and safe manner.--The student will be able to: |
| * 1. Identify the proper tool for a given job. |
| * 1. Use tools and machines in a safe manner. |
| * 1. Adhere to laboratory safety rules and procedures. |
| * 1. Identify the application of processes appropriate to the task at hand. |
| * 1. Identify materials appropriate to their application. |
| 1. Demonstrate proficiency using business productivity software skills.--The students will be able to: |
| * 1. Create a report or essay that contains a title page, text, a graphic/image, and data table. |
| * 1. Create a spreadsheet to analyze and present data. |
| * 1. Produce a presentation that includes text, graphics, and digital images and present it using a projection system. |
| 1. Demonstrate and apply computer-aided design (CAD) knowledge and skills.-- The student will be able to: |
| * 1. Apply CAD skills to an engineering project. |
| * 1. Create a part using a solid modeling CAD software platform to be incorporated into an assembly. |
| * 1. Create an assembly drawing using a CAD software platform. |
| * 1. Create working drawings using a CAD software platform. |
| * 1. Create a bill of materials generated from a CAD application. |
| Mechanical Engineering Discipline |
| 1. Demonstrate an understanding of design and development of solutions involving mechanical engineering, their environments, and their associated design constraints.--The student will be able to: |
| * 1. Describe mechanically engineered assemblies used in industrial manufacturing, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe mechanically engineered assemblies used in aviation and aerospace, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe mechanically engineered assemblies used in hazardous or dangerous environments (e.g., underground, damaged buildings, et al), the technologies they employ, their design criteria, and constraints. |
| * 1. Describe mechanically engineered assemblies used in the medical field, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe mechanically engineered assemblies used in underwater environments, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe mechanically engineered assemblies used in high speed/repetitive manufacturing or processing environments, the technologies they employ, their design criteria, and constraints. |
| 1. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.--The student will be able to: |
| * 1. Design and build a solution to a problem using the principles of mechanical engineering. |
| * 1. Incorporate principles of electricity, thermodynamics, hydraulics, and pneumatics, as appropriate, into the design of a mechanically engineered solution. |
| * 1. Incorporate at least one advanced feature into the solution’s design. |
| * 1. Create a project portfolio describing the project and the solution, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results. |
| * 1. Present your portfolio to a review committee. |
| Electrical Engineering Discipline |
| 1. Demonstrate an understanding of design and development of solutions involving electrical engineering, their environments, and their associated design constraints.--The student will be able to: |
| * 1. Describe electrical engineering applications used in power distribution and transmission systems, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe electrical engineering applications used in control systems (e.g., PLC's, microcontrollers), the technologies they employ, their design criteria, and constraints. |
| * 1. Describe electrical engineering applications used in DC and AC electronics, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe electrical engineering applications used in signal processing and telecommunications, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe electrical engineering applications used in sensors and instrumentation applications, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe electrical engineering applications used in consumer electronics and computer applications, the technologies they employ, their design criteria, and constraints. |
| 1. Demonstrate technical knowledge and skills associated with the design of electrical and electronic systems.--The student will be able to: |
| * 1. Understand the connectivity between the major components. Identify Address and data buses, power signals and peripheral devices. |
| * 1. Recognize the schematic symbols for basic electronic components (e.g., resistors, capacitors, inductors, transistors, and black box components such as microprocessors). |
| * 1. Describe basic logic devices (e.g., AND, NAND, OR, NOR) and their role in the design of electrical/electronic systems. |
| * 1. Create and apply the truth tables for the basic logical elements (i.e., AND, NAND, OR, and NOR gates). |
| * 1. Identify electrical connections between devices on an electrical schematic. |
| * 1. Use Boolean algebra to minimize logic equations and implement them in breadboard devices. |
| * 1. Design and create a prototype of a basic electronic system to demonstrate knowledge of a series and parallel logic circuitry. |
| 1. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.--The student will be able to: |
| * 1. Design and build a solution to a problem using the principles of electrical engineering. |
| * 1. Incorporate principles of electricity, AC/DC circuits and electronics, microcontrollers or PLC's, electronic sensors, transducers and instrumentation, or communications/RF systems, as appropriate, into the design of an electrically engineered solution. |
| * 1. Incorporate at least one advanced feature into the solution’s design. |
| * 1. Create a project portfolio describing the project and the solution, including drawings and specifications, the tasks and rationale, process journal, budget report, and statistical analysis of the results. |
| * 1. Present your portfolio to a review committee. |
| Civil Engineering Discipline |
| 1. Demonstrate an understanding of design and development of solutions involving civil engineering, their environments, and their associated design constraints.--The student will be able to: |
| * 1. Describe civil engineered solutions used in coastal area planning, construction and structural design, transportation, GIS and surveying, urban and water resources. |
| * 1. Describe civil engineering solutions, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe civil engineering solutions used in coastal areas (e.g. bridges, dams, locks, levees, waterways, ports, etc.), the technologies they employ, their design criteria, and constraints. |
| * 1. Describe civil engineering solutions used in structural design and structural analysis of buildings, bridges, towers, tunnels, etc. , the technologies they employ, their design criteria, and constraints. |
| * 1. Describe civil engineering solutions used in designing, constructing, and maintaining transportation infrastructure (e.g. including roadways, railways, airports and mass transit systems, et al.). |
| * 1. Describe technologies used in the basics of surveying and mapping, as well as geographic information systems to correctly size and position structures, and lay out routes for railways, roadways, and pipelines. |
| * 1. Describe civil engineering solutions used in urban and metropolitan planning (e.g. designing, constructing, and maintaining streets, sidewalks, water supply networks, sewers, street lighting, solid waste management and disposal, public parks, et al), the technologies they employ, their design criteria, and constraints. |
| 1. Design and build a mechanically engineered solution suitable for a particular application in a defined environment.--The student will be able to: |
| * 1. Design and build a solution to a problem using the principles of civil engineering. |
| * 1. Incorporate one or more principles of structural design and analysis, surveying, planning and design of traffic system logistics, coastal defense, materials science, water resource and waste management, or urban planning as appropriate, into the design of a civil engineering solution. |
| * 1. Incorporate at least one advanced feature into the solution’s design. |
| * 1. Create a project portfolio describing the project and the solution, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results. |
| * 1. Present your portfolio to a review committee. |
| Environmental Engineering Discipline |
| 1. Demonstrate an understanding of design and development of solutions involving environmental engineering, their environments, and their associated design constraints.--The student will be able to: |
| * 1. Describe environmental engineered solutions, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to water supply and treatment, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to waste management, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to air and water pollution, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to coastal and intercoastal environments, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to agricultural environments, the technologies they employ, their design criteria, and constraints. |
| * 1. Describe environmental engineered solutions related to industrial environments, the technologies they employ, their design criteria, and constraints. |
| 1. Design and build an environmental engineered solution suitable for a particular application in a defined environment.--The student will be able to: |
| * 1. Design and build a solution to a problem using the principles of environmental engineering. |
| * 1. Incorporate principles of contamination control, pollution control, emission control, hazardous material disposal, and physical, biological, and chemical processes, as appropriate, into the design of an environmental engineered solution. |
| * 1. Incorporate at least one advanced feature into the solution’s design. |
| * 1. Create a project portfolio describing the project and the solution, including drawings and specifications, the tasks and rationale, process journal, budget report, and the results. |
| * 1. Present your portfolio to a review committee. |

# 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.

### Academic Alignment

Secondary Career and Technical Education courses are pending alignment to the B.E.S.T.  (Benchmarks for Excellent Student Thinking) Standards for English Language Arts (ELA) and Mathematics that were adopted by the State Board of Education in February 2020.  Academic alignment is an ongoing, collaborative effort of professional educators that provide clear expectations for progression year-to-year through course alignment. This initiative supports CTE programs by improving student performance through the integration of academic content within CTE courses.

**Florida Standards for English Language Development (ELD)**

English language learners communicate for social and instructional purposes within the school setting. ELD.K12.SI.1.1

English Language Development (ELD) Standards Special Notes:

Teachers are required to provide listening, speaking, reading and writing instruction that allows English language learners (ELL) to communicate for social and instructional purposes within the school setting.   For the given level of English language proficiency and with visual, graphic, or interactive support, students will interact with grade level words, expressions, sentences and discourse to process or produce language necessary for academic success. The ELD standard should specify a relevant content area concept or topic of study chosen by curriculum developers and teachers which maximizes an ELL’s need for communication and social skills. To access an ELL supporting document which delineates performance definitions and descriptors, please click on the following link: <http://www.cpalms.org/uploads/docs/standards/eld/SI.pdf>.

For additional information on the development and implementation of the ELD standards, please contact the Bureau of Student Achievement through Language Acquisition at [sala@fldoe.org](mailto:sala@fldoe.org).

### Special Notes

MyCareerShines is an interactive resource to assist students in identifying their ideal career and to enhance preparation for employment. Teachers are encouraged to integrate this resource into the program curriculum to meet the employability goals for each student. Access MyCareerShines by visiting: [www.mycareershines.org](http://www.mycareershines.org/).

### Career and Technical Student Organization (CTSO)

The Florida Technology Student Association (FL-TSA) and SkillsUSA are the intercurricular career and technical student organizations 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.

### 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.

Work-Based Experience (8601800) is the appropriate course to provide Engineering & Technology Education students with the opportunity, as Student Learners, to gain real world practical, first-hand exposure in broad occupational clusters or industry sectors through a structured, compensated or uncompensated experience. Work-Based Experience (WBE) is also designed to give the Student Learners an opportunity to apply and integrate the knowledge, skills, and abilities acquired during their School-Based Experience to actual work situations independent of school facilities. At least one credit of Engineering & Technology Education program consisting of three credits must be completed before enrolling in WBE. See the Work-Based Experience framework for more information.

### 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. 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 course or a modified course.  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 a Career and Technical Education (CTE) course. The student should work on different competencies and new applications of competencies each year toward completion of the CTE course.  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.

### Additional Resources

For additional information regarding articulation agreements, Bright Futures Scholarships, Fine Arts/Practical Arts Credit and Equivalent Mathematics and Equally Rigorous Science Courses please refer to:

<http://www.fldoe.org/academics/career-adult-edu/career-tech-edu/program-resources.stml>